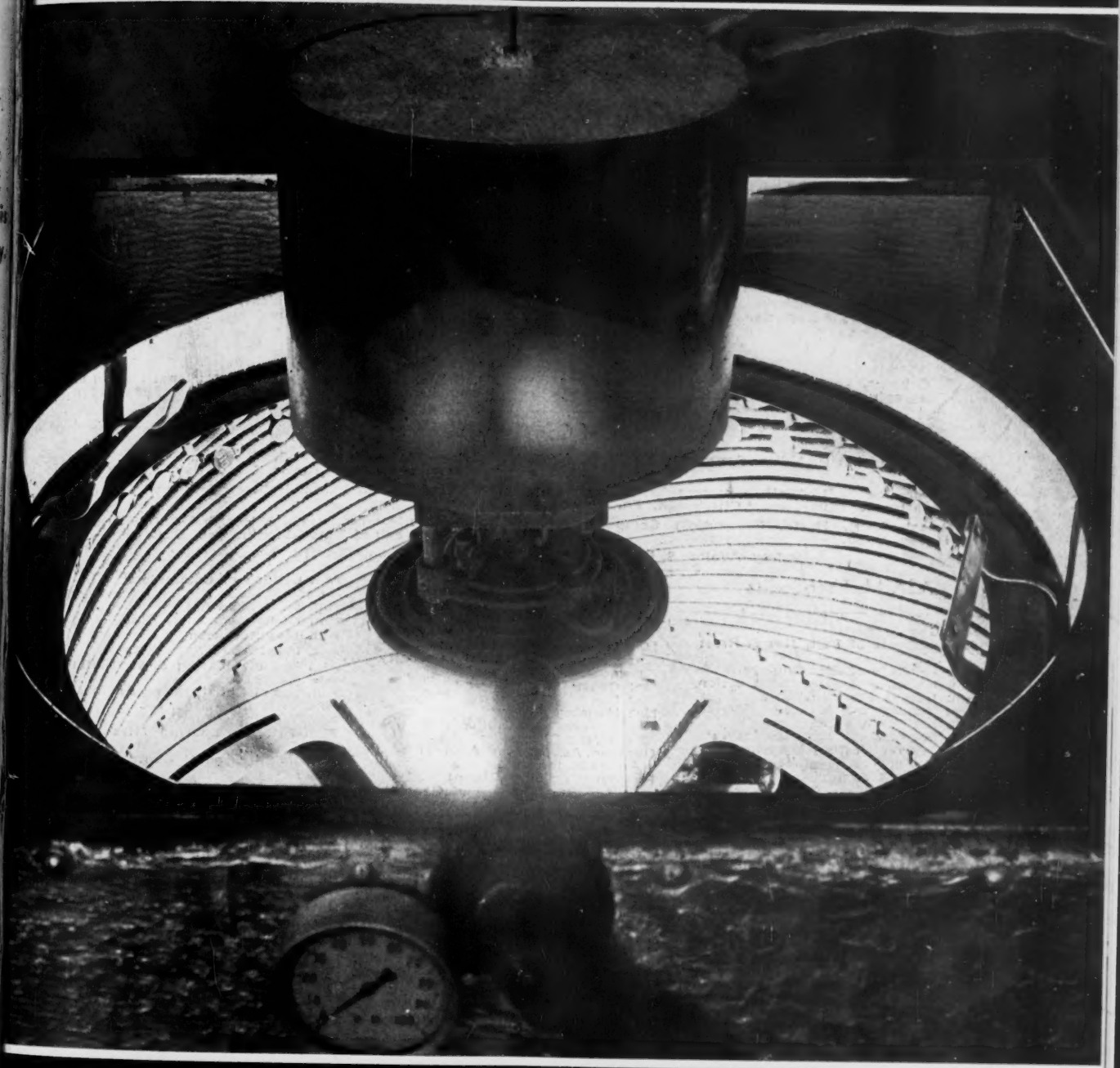
# Industrial Standardization

*and* Commercial Standards Monthly



May

New Edition of Standard for URC Weatherproof Wire

(See Article on Page 146)

1943

# American Standards Association

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# Industrial Standardization

And Commercial Standards Monthly

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RUTH E. MASON, Editor


*Our Front Cover:* URC wire being subjected to an accelerated weathering test in a Weather-Ometer at Purdue University. (Article page 146.)

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**Standardization is dynamic, not static. It means not to stand still, but to move forward together.**


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May, 1943

Vol. 14, No. 5

Entered as Second Class Matter February 14, 1941, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

*Office of Price Adm*

Points and prices are Mrs. Consumer's twin worries today.

# Standards and Labeling In Controversy

THE whole subject of standards and their use is the center of a sharp controversy now raging in Washington which has brought standards and their use in labeling under investigation by Congress, through the House Committee on Interstate and Foreign Commerce. The Committee brought the controversy to a head on May 6 when it sent a letter to Prentiss Brown, director of the Office of Price Administration, requesting that he postpone the effective date of all OPA orders containing standardization or labeling requirements, whether already issued or still under consideration, until the committee has proceeded farther with its investigation. The committee made special reference to any orders which might affect hosiery, underwear, work clothes,[1] or food, or similar orders "affecting standardization, grading, or curtailment of production." Despite the committee's request, Mr. Brown refused to delay the effective date of the OPA rayon hosiery order, which specifies minimum standards for Grade A hosiery, and requires that all women's rayon hosiery be marked Grade A or Grade B.

The committee's letter was addressed to the Office of Price Administration alone, although the War Production Board, not the OPA, issues limitation orders for "curtailment of production." The Office of Price Administration is, of course, charged with the responsibility of controlling inflation through control of price rises.

In its resolution authorizing the investigation into standards and labeling, the House of Representatives directed its Committee on Interstate and Foreign Commerce to conduct an investigation for the purpose of determining "Whether the War Production Board, the Office of Price Administration, or any other agency or officer in the executive branch of the Government is formulating plans with a view to putting into effect (*a*) requirements with respect to Federal grade labeling of articles or commodities, and (*b*) any other requirements intended to bring about simplification and standardization of production, marketing, and distribution of articles or commodities, as well as concentration of industry or production." The resolution authorized the committee to determine whether, and to what extent, the formulation and carrying out of such plans are necessary in connection with the war effort; and the extent to which any such plans may represent an attempt to change the domestic economy along lines not authorized by Congress.

This presumably refers to a provision in the Price Control Act which says: "The powers granted in this section shall not be used or made to operate to compel changes in the business practices, cost practices, or methods, or means or aids to distribution, established in any industry, except to prevent circumvention or evasion of any regulation, order, price schedule, or requirement under this act."

### Essential Facts of the Situation

For an understanding of the controversy, which is assuming the proportions of a major battle, it is necessary to consider certain essential elements of the situation. After long consideration, the Office of Price Administration, charged with the responsibility of controlling prices, arrived at two general decisions. These decisions have been expressed both by Leon Henderson, when he was Price Administrator, and by the new Administrator, Prentiss Brown. The more basic of these two decisions has to do with the function and administration of price control itself. If prices on goods are to be fixed, the OPA concluded, some means must be available by which the product for which that price is to be paid can be identified. A standard is a tool for such identification. In the words of Prentiss Brown, standards make it possible for OPA "to set uniform dollars-and-cents ceiling prices at the processor level and to carry these ceilings through to the consumer." This decision has been strengthened as OPA is more and more turning to dollars-and-cents price ceilings on specific types and grades of products rather than ceilings based on mark-ups or on prices charged at a certain time in the past.

The second conclusion to which the OPA arrived after months of experience was that even when standards (or identifications) for goods have been set up by the OPA as a basis for its price orders, price ceilings cannot in practice be enforced unless the buyer knows whether he is

[1] The American Standards Association now has projects under way at the request of the OPA on women's work clothes and sizes of children's garments, and has completed six War Standards for safety shoes and four standards for repair parts for civilian radio.

GRAND UNION
TINY GREEN
LIMA BEANS
CONTENTS 1 LB. 4 OZ.
DISTRIBUTED BY
THE GRAND UNION COMPANY
NEW YORK, N.Y.
Grade A
GRAND UNION
"Distinctive Quality"
The lot of which the contents of this can are a part has been tested by accepted methods and is GRADE A.
Grade A scores 90 points or over.
Grade B scores 75 to 89 points inclusive.
Grade C scores 60 to 74 points inclusive.
DESCRIPTION OF CONTENTS
Packed from fresh young tender lima beans. Green in color. Beans are size "Tiny." Liquor reasonably clear. Practically free from defects such as skins, broken beans, etc. Possess a normal lima bean flavor.
Can size—No. 2. Total net weight—1 lb. 4 oz.
Yields 4 or 5 servings.
THIS IS THE TYPE OF LABEL SUGGESTED BY THE NATIONAL CONSUMER-RETAILER COUNCIL, INC.
FRESHPAK
GREEN AND WHITE
Lima Beans
CONTENTS 1 LB. 4 OZ.
FRESHPAK
BRAND
"Unfailingly Uniform in Quality"
GRADE B
DISTRIBUTED BY THE GRAND UNION COMPANY, NEW YORK, N.Y.
The lot of which the contents of this can are a part has been tested by accepted methods and is GRADE B.
Grade A scores 90 points or over.
Grade B scores 75 to 89 points inclusive.
Grade C scores 60 to 74 points inclusive.
DESCRIPTION OF CONTENTS
GRADE B. Packed from young tender lima beans of which not less than 50% are green in color. Beans are of medium size. Liquor surrounding beans slightly cloudy. Reasonably free from defects such as loose skins, etc. Possess a normal lima bean flavor.
Can Size—No. 2 Total net weight—1 lb. 4 oz.
Yields 4 or 5 servings.
THIS IS THE TYPE OF LABEL SUGGESTED BY THE NATIONAL CONSUMER-RETAILER COUNCIL, INC.

**Labels used by a food chain showing brand name and grade.**

receiving the goods on which the OPA price ceiling has been fixed. The OPA has decided that its staff is completely inadequate to enforce its price orders without the collaboration of the trade and the consuming public. Accordingly, when the product is enclosed in a package or can so that the buyer has no way of judging for himself what he is buying, the OPA has concluded that some identifying mark (grade label) should be placed on the package or can as a means of helping the customer decide whether the product she is buying is the product on which the price ceiling has been placed.

Standards are not only used by the Office of Price Administration as the basis of price ceiling orders, but also by the War Production Board in limitation orders. The Office of Price Administration and the War Production Board work closely together to avoid working at cross purposes or duplication of effort. Standards are used by the War Production Board as a potent means to prevent the waste of materials, manpower, and productive facilities in providing both the Armed Services and the civilian population with the products they need.

The present controversy in Washington on standards and grade labeling centers around two OPA price orders calling for grade labeling of canned goods and of hosiery.

Grading of canned goods started some 17 years ago when the canners themselves appealed to the Government to set up standards to define such technical details as color, content, degree of perfection, and uniformity. Such standards made it easier to set a value on the stock and to borrow money on the season's output, pending sales.

The Fancy (A), Choice (B), and Standard (C) grade designations are now used throughout the wholesale market down to the retailer. The grade marks, however, do not appear on the can in the entire pack.

The industry is divided on the subject of grade labeling. There are three different schools of thought: one which is opposed to carrying the standards through to the consumer by means of grade labeling (the National Canners Association speaks for this group); a second which, on the contrary, grade labels each can and contracts with the Department of Agriculture to carry out the grading under Continuous Inspection; and a third whose product is grade labeled and marketed through the great food chain distributors. In this last, the food chains follow the recommendations of the National Consumer-Retailer

Council. The labels used by the last two groups place the customary main emphasis on the brand names, the grade markings being added as a secondary feature to give information to the consumer and to strengthen the brand name. Under encouragement of the NCRC most of the larger food chains, including the Grand Union Stores, A&P, and the Kroger Stores, label their brands by grade as well as with descriptions of the contents of the cans.

The Department of Agriculture's inspection service, which permits canners to use a label stating that the grade marked is "U. S. Grade," has increased rapidly during the few years in which it has been active. Trained government inspectors are provided by the Department to carry on a "continuous inspection" service in the canning factories. Factories in which this service is provided must meet standards of sanitation and efficiency. Only the lack of trained inspection personnel has prevented the program from increasing even faster than it has in the past, it is reported. A recent report indicates that 63 companies operating 78 plants are now packing under the Continuous Inspection Service of the U. S. Department of Agriculture and are grade labeling their canned goods as "U. S. Grade" A, B, or C.

### Canned Goods Order Started Controversy

An OPA order setting prices on grades of canned grapefruit juice and requiring that the grade designation appear on the 1943 pack started the present controversy. This order was issued last December, but the OPA announced that similar orders would be issued from time to time covering other canned goods.

Immediately, the National Canners Association placed itself on record in opposition to the order. In a resolution adopted in December, 1942, the Association stated that it must "both record its dissent and vigorously reject as unnecessary and unworkable" the OPA proposal for grade labeling of canned foods in connection with its 1943 price control program. The Association termed the plan "an unwarranted interference with an industry whose attention and energy must be devoted fully to the war effort." Other opponents of grade labeling declare that it would "cause a competitive situation where the best manufacturers would be forced to pack down to a grade in order to stay in business. If there were no competition for excellence, but only the government standard to meet, all packers would have to pack to that grade. In other words, grade labeling would place a ceiling on quality, rather than a floor under it." Throughout all these objections runs the argument that grade labeling would destroy the value of brand names.

In the meantime, the *Canning Trade*, business paper of the canning industry, has published an editorial supporting that part of the industry which is in favor of grade labeling. The paper states: "All canners are not in opposition to grade labeling. . . . The necessity to grade the goods, as the canner knows them, will not hinder, much less reduce, the output. Since time immemorial, canned foods have been sold [to the distributor] strictly on a grade basis."

Since 1918 all cans of fruits and vegetables sold in Canada have been inspected and grade labeled.

On May 18th OPA announced the cancellation of the requirement for grade-labelling the 1943 pack. Instead OPA will require that dealers' invoices show the grades of the merchandise, and will provide a method to enable consumers to ascertain the grade at the point of purchase. The announcement stated that the alternate plan "will secure in large part the same enforcement advantages as the marking of the grade on the label."

The OPA said that the new plan will not only supply retailers with a knowledge of the grade of canned goods, but that further steps will be taken to make it possible for any interested housewife to know the grade, perhaps by making it mandatory for the retailer to show the grade on signs displayed in his store.

### Women's Rayon Hosiery

The OPA price order on women's rayon hosiery (MPR 339) requires that the grade, the gauge or needle count, and an indication as to size must appear on all rayon hosiery sold at retail. Specifications for Grade A and Grade B hosiery are outlined by the OPA. Grade A in this case provides minimum specifications for hosiery of a fair degree of durability, fit, and appearance, and differs from the accepted use of the term "Grade A" in that it denotes acceptable rather than Fancy hosiery. Hosiery which fails to meet these minimum specifications in any particular are Grade B under this order.

The trade protested against the grade labeling order, and the OPA granted an extension of time during which hosiery not meeting the Grade A specifications could be sold from stock at Grade A prices.

In hearings before the Small Business Subcommittee of the Senate on May 11, Flint Garrison of New York City, special consultant to the Wholesale Dry Goods Institute, said: "As we see it, the OPA is attempting to apply a principle of price control which can be made to work equitably only by revolutionizing business practices of the industry."

J. K. Galbraith, deputy OPA Administrator, told the subcommittee that there had been no pressure from the hosiery industry for the new regulation but that consumer protection had made it necessary because the industry had gone on a "runaway ride" with quality going down and prices going up.

In ordering that MPR 339 be made effective May 15 as scheduled, Administrator Brown told the National Association of Hosiery Manufactur-

ers that the regulation "will be scrutinized over a period of three or four months to determine how the trade fares during this initial period under the regulation." He outlined the following program:

1. The whole question of price differentials and classifications for manufacturers and distributors will be closely re-examined for the purpose of determining whether unfairness results from any of the established differentials and classifications.

2. Serious consideration will be given to the proposal of certain manufacturers that one or more classifications should be set up for "AA" hosiery—hosiery having additional features which give the stocking a greater value than "Grade A" provided by the regulation. OPA will be hospitable to the idea if appropriate specifications can be worked out with the WPB for such hosiery.

3. The industry is invited to consider the advisability of giving manufacturers the option of using the words "Grade A or better" or some other substitution for "Grade A" in the marking requirements.

4. OPA will prepare a booklet which will contain tables of prices and which will point out that "Grade A" may be better in quality than the minimum specifications.

The War Production Board has now issued a Limitation Order intended to conserve materials, manpower, and production facilities by limiting production to the better-wearing grades of hosiery. Its specifications coincide with those issued by the OPA.

Grade labels have already been put into effect by OPA in one major consumer field without controversy having arisen. The new price order on meats gives price differentials for different grades. The grades are stamped on each major cut so that consumers have an opportunity of checking on the price charged for the grade of meat they buy. In small and independent stores, for example, chuck pot roast is priced at 24, 28, 33, 34, and 35 cents for the five grades from D through AA.

The question of standardization and grading was considered by the House of Representatives when Representative Lyle H. Boren of Oklahoma presented a bill which would have given the National Bureau of Standards authority to "set up standards of quality based on performance as a guide in the purchase of consumer goods." Representative Boren is now chairman of the subcommittee which is in direct charge of the investigation on standardization and grade labeling now being carried on by the House Committee on Interstate and Foreign Commerce.

### Wide Discussion of Standards

The whole question of standards and their use in labeling is being widely discussed.

Consumer and retailer members of the Advisory Committee on Ultimate Consumer Goods at a meeting April 7 voted a resolution endorsing the use of minimum standards of serviceability for consumer goods, and the use of labeling to show conformity with the basic specifications or grades. The ACUCG sent a copy of its resolution to Messrs. Byrnes, Brown, Nelson, and Zimmerman. The procedure followed by the committee has been challenged in the ASA Board and Standards Council on the grounds that it might be misinterpreted as committing the ASA without action by the Board or Council.

Many of the same organizations which were instrumental in bringing about the adoption of the present Food, Drug, and Cosmetic Law are now lined up in support of the Office of Price Administration's grade-labeling activities. In addition to the old guard—the American Association of University Women, the American Home Economics Association, the Cooperative League of the United States of America, the League of Women Shoppers, the Young Women's Christian Association—is the added strength of the American Federation of Labor and the Congress of Industrial Organizations. A new Consumer Clearing House, it is reported, is being formed in Washington, with Caroline Ware of the American Association of University Women, as secretary. Donald Montgomery, at one time consumer counsel to the U. S. Department of Agriculture, and now consumer counsel of the United Automobile Workers, CIO, is active in the new Clearing House. It is expected to take action on such issues as grade labeling, standardization and rationing.

Recently the CIO attacked the Bureau of Labor Statistics' cost-of-living figures on the basis that prices have not been pegged to quality, and that depreciation of quality has resulted in a hidden rise in price which has not been taken into consideration. The CIO Women's Auxiliary announces that a campaign to mobilize every housewife behind the CIO program to demand grade labeling as well as roll-back of prices, and dollars-and-cents retail prices is to be undertaken immediately.

### National Groups On Record

The conviction that price control is impossible without labeling of canned goods by grade was expressed recently by 15 national organizations, including the labor organizations, in a letter to President Roosevelt; James F. Byrnes, Director of Economics Stabilization; and Prentiss Brown, Price Administrator. The letter, which protested a recent statement by Mr. Brown questioning his power to require grade labeling, said in part:

"When you announced in February that grade labels would be required on the 1943 pack of fruits and vegetables, your action was welcomed by the overwhelming majority of the people of the country.

"Canners, manufacturers, and processors, retail, consumer, labor, and civic groups upheld your declaration, for they knew that price control could not be made effective until grade labeling was an accepted practice. They knew that it would be impossible to control the price of any commodity unless the quality, as well as the price, could be clearly determined by the buyer at the

time the purchase was made. They knew that without quality labels buyers might be lulled into a false security by a fixed price for a constantly depreciating product, which is a dangerous way for inflation to sneak in by the back door. . . .

"We, the undersigned national organizations, wish to register our united protest against the continued uncertainty with regard to this essential war issue. We reaffirm our conviction that grade labeling is not only entirely feasible; it is an urgent war necessity. The controversy as to whether grades shall or shall not be shown is a controversy as to whether price control shall or shall not be enforced."

This letter was signed by the American Association of University Women; the American Home Economics Association; the Congress of Industrial Organizations; the Congress of Women's Auxiliaries, CIO; Consumers' Union; the Cooperative League of the United States of America; Ladies Auxiliary, Brotherhood of Sleeping Car Porters; League of Women Shoppers; National Association for the Advancement of Colored People; National Council of Negro Women; National Farmers Union; the National Federation of Settlements; the National Women's Trade Union League; and the Young Women's Christian Association.

## Seven New Standards Included in 1943 SAE Handbook

THE new *SAE Handbook* published by the Society of Automotive Engineers includes all the current standards and recommended practices of the Society, except those specifically for aeronautical use. The *Handbook* presents the standards in ten sections: Aeronautical parts, materials and codes; Units, parts and fittings; Processed materials; Fabricated materials; Screws, bolts, and washers; Tests, ratings, and codes; Transportation and maintenance; Tools and production equipment; Nomenclature, tolerances, conversions; and Miscellaneous.

Seven new standards and 17 revised ones appear in the 1943 *Handbook* for the first time.

"Standardization has been a fundamental branch of the Society of Automotive Engineers' activities since the earliest days of its history," the *Handbook* explains. "Its pioneer members fully appreciated the great advantage that would accrue to the industry by unification and stabilization through standardization of the then established practices and of the rapidly developing new practices as they were accepted by the industry and became established.

"It is the policy of the Society to refrain from attempting standardization of projects still in a fluid or development stage, and to undertake such stabilization only when the project has been adequately accepted and adopted in practice by industry. By adopting this policy originally and adhering to it and by consistently avoiding over-standardization, stagnation of development is avoided. On the other hand progress in practice is followed by revision and extension of standards to keep pace with advancement in industry."

The SAE has cooperated in the work of the American Standards Association on both national and international projects for many years. It is acting as sponsor for ten sectional committees and is represented on 28 others. SAE standards, such as those for screw threads, screws, bolts and nuts, and anti-friction bearings in which other mechanical industries have a common interest with the automotive industry, have been approved by the American Standards Association as American Standard.

Copies of the 1943 *SAE Handbook* can be obtained from the Society of Automotive Engineers, 29 West 39th Street, New York, for $5.00.

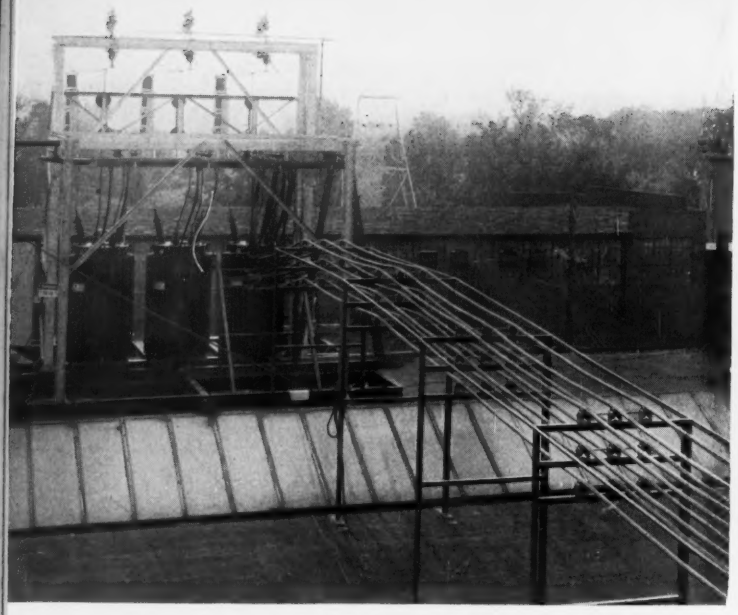
## IRAM Asks ASA for Comments On Argentine Draft Standard

The Argentine national standardizing organization, Instituto Argentino de Racionalizacion de Materiales (IRAM), is now considering approval of an Argentine standard for converting units to the Meter Kilogram Second (MKS) rationalized system. A copy of the draft standard has been sent to the American Standards Association by IRAM with a request that it be referred to those concerned in the United States, and that their comments be forwarded by the ASA to the Argentine national standardizing association.

The MKS system is based on the meter, the kilogram, and the second. It was adopted as an international system of units by the International Electrotechnical Commission in 1935.

The IRAM has compiled an extensive list of factors which may be used for conversion of quantities from the Centimeter Gram Second system to the MKS system. Electrical communication is the particular purpose of the draft, it was pointed out.

In accordance with the request from IRAM, the draft is being circulated by the ASA for comments and criticism.



One million circular mil URC weather-resistant cables per phase release rubber or varnished cambric for war use.

A new edition of the American Standard Specifications for Weather-resisting (Weatherproof) Wire and Cable, URC Type (C8.18-1942) has been approved and published by the American Standards Association. Copies can be obtained from the ASA at 25 cents.

Seventeen other standards and specifications for wire and cable are available from the American Standards Association. A price list may be obtained upon request.

# New Edition of Standard Recognizes Wide Use of URC Weatherproof Wire

by C. T. Sinclair[1]

*Chairman, ASA Technical Committee No. 12*

IN OUR present all-out war program, construction of war plants to produce armaments is competing with the very items of armament to be produced, as both require the use of scarce materials—steel, copper, aluminum, rubber, and tin. As a result of this unprecedented demand for materials, we are forced to resort to such substitutes as American ingenuity can develop or discover, and, as an effective solution, to reduce the quantities of such vital materials needed for the construction program.

In our search for methods of releasing scarce materials from less essential to more essential purposes, the use of URC[2] weatherproof wire and cable has played an important, though perhaps little noticed, part. Although the great volume of weather-resisting wire both in war and in peace-time is used for overhead line construction, its use for other purposes is of special interest in wartime. URC weatherproof wire and cable installed as open mill type construction or outdoors for industrial plant expansion, for example, has released conventional insulating materials such as rubber and varnished cambric. It has also reduced the use of steel by eliminating the steel conduit, and has reduced conductor size for short heavy industrial circuits where voltage drop or regulation would not be sufficient to affect electrical equipment.

In war plant construction Government agencies have required the use of weatherproof wire and cable and other electrical wiring materials using less vital rubber and metal. In the interest of the war program, various code authorities have sanctioned changes in construction requirements to permit these substitutions.

The most practical use of weatherproof wire and cable for interior mill type construction is in the larger, heavier circuits. Small size weatherproof conductors used in open wiring indoors cannot be regarded as practical by comparison with the easily installed non-metallic sheath cable assemblies, especially with manpower so necessary for armament production, and with speed of war plant addition so vital. Even in the non-

[1] Duquesne Light Company.

[2] Utilities Research Commission.

metallic sheath cables, weatherproof and other forms of non-rubber insulated conductors are required to be used as the neutral conductor.

The illustrations in this article demonstrate the application of large-size URC weatherproof cable, with several conductors per phase, properly alternated to reduce reactance, in the construction of a high-current capacity low-voltage industrial generating station to utility substation tie line.

### Vital Materials Saved

The use of weatherproof cable has solved this troublesome problem as to speedy construction of new facilities by avoiding conflict with existing industrial areas and by giving a free choice in selection of substation location. It provides a truly "flexible connecting bus" and saves vital materials at the same time.

Most applications of weatherproof wire are, of course, so much taken for granted as part of the war-time industrial plant background as to pass unnoticed in any photograph and, further, most pictures giving such details are not to be published for the duration. It is for this reason that only an outdoor application of weatherproof cable of such size has been illustrated.

While the use of weatherproof wire as a means of releasing scarce materials is especially interesting at the present time, its greatest importance and widest use is in overhead line construction. Since the early days of the electrical industry, weather-resistant wire has been used in quantity for overhead line construction and there is scarcely a town or village reached by electrical service that does not have "weatherproof" wire on its street. Under present wartime conditions, great quantities are also used in line construction in military camps and establishments.

The construction methods described earlier in this article are reminiscent of the early days of the electrical industry when open mill type wiring methods were universal. There is an important difference now, however—URC weatherproof is a vastly more uniform and long-lived product than was available before the Utilities Research Commission of Chicago sponsored the development work carried out at Purdue University. More than ten years of commercial production and use of the URC weatherproof developed as a result of their tests have firmly established the soundness of this research work and of the materials and methods selected to produce uniformly long life for all weatherproof wire and cable installed and operated in any part of the world.

### URC Used Universally

Frequent inspection of weatherproof wire and cable installed at various intervals as far back as the early nineteen hundreds, and interchange of information and observations between those interested, together with study of the research findings and observations of URC weatherproof installed since 1930, substantiate conclusively the uniformly long life which may be expected from this product. As a result of the effort spent in this development, URC weatherproof has been universally used since the early thirties. It has been bought either according to the American Standard Specifications or to individual purchasers' specifications embodying all the essential requirements.

URC weatherproof has come to be taken for granted as the type that every manufacturer will furnish—even by many purchasers who investigated the subject thoroughly before changing to it. For this reason it is well to point out here that the basic changes made in weatherproof wire as a result of the URC investigations adapt the product unusually well to handle the severe loads imposed by use in the war production plant or in the utility system supplying such plants.

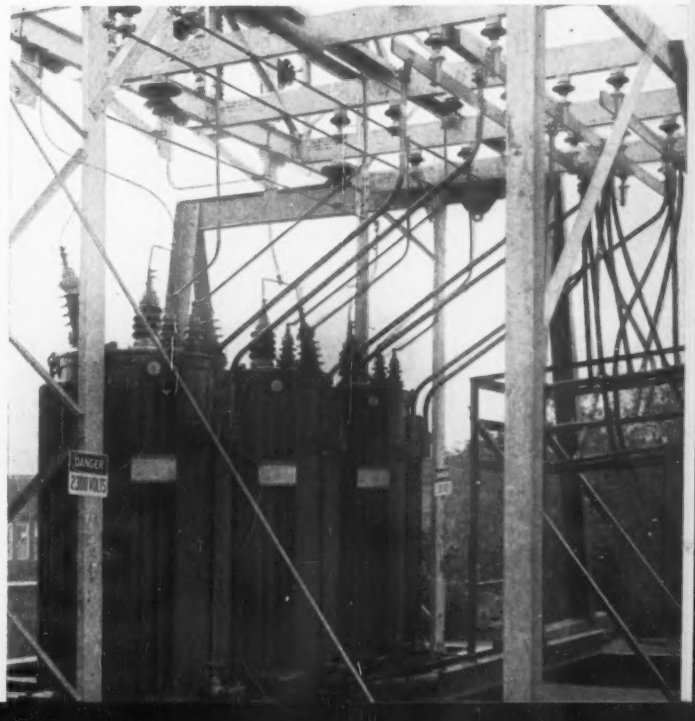
### Two Major Changes Made

Two major changes, both having to do with the weatherproofing compounds, were made in the wire following the URC tests.

The saturant was changed to the air-blown asphalt type of high softening point and low temperature susceptibility; that is, it now has great resistance to flow from the covering at high temperatures (especially important at high electrical loads) and reasonable pliability at low temperature plus long time stability or retention of the desirable properties (slow aging).

The finishing compound was changed as to composition (by performance requirements) and method of application (again by performance requirements and the mineral filler requirement)

**Industrial substation, utilizing heavy weather-resisting cable, provides "flexible connecting lines" and saves vital materials.**



to give reasonably uniform coverage of the saturated braid, and slow aging or wearing away of the finish to an almost leather-like coating that seems little changed after as much as twelve years' outdoor exposure, carrying electrical load.

In view of the experience indicated above, no longer should reference be made to weatherproof wire that loses saturant and finish with resultant shedding of braids in a few years. The old and almost universal question as to the life of weatherproof wire which has colored the attitude of many of us who have used it should be eliminated now.

### Standard Revised

Because of this satisfactory performance, the American Standards Association has now approved and published American Standard Specifications for Weather-Resistant (Weatherproof) Wire and Cable, URC Type (C8.18-1942). This edition supersedes the earlier C8.18-1936 and drops all reference to the older type weatherproof wire and cable included in specification C8k1-1932.

The Technical Committee of the Association is fortunate in having had the continued assistance of the original members of the Utilities Research Commission interested in weatherproof wire and cable, and of the original research workers, L. L. Carter and J. W. Olson, who have contributed much in the industry-wide adoption of URC weatherproof. The various utilities and manufacturers have given generously of their experience in following the life performance of selected samples. Purdue University has also cooperated by maintaining intact all outdoor test racks and samples.

The new standard for weatherproof wire and cable C8.18-1942 differs from C8.18-1936 only in editorial matter and in the elimination of reference to specification C8k1-1932, with rearranged tables for greater convenience. No change of any kind in the really significant construction or control details has been made.

A similar degree of protection for aerial rubber-insulated braid-covered cable is provided by American Standard Specifications for Weather-Resistant Saturants and Finishes for Aerial Rubber-Insulated Wire and Cable (C8.19-1939), requirements for the saturant having been modified in this specification.

It is significant that only one emergency change may be required as a result of war-time material shortages. This would permit the use of either single or two-ply cotton yarns in the outer braid as is now permitted for the inner braids. The requirements of the war have made it difficult to obtain all sizes of two-ply yarns, and permission to substitute single-ply yarns would materially ease this situation without adversely affecting the life of the covering so long as all other requirements are met.

The cooperative effort of all concerned in this project has produced a superior weather-resistant wire. More than ten years' experience with wire and cable made under controls embodied in this specification supports the belief that industry now has a weather-resistant wire that may be depended upon for satisfactory performance.

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## British Standard Code for Temperature Measurement

THE British Standards Institution has issued a Code for Temperature Measurement (BS 1041-1943) which it believes will be a great convenience to engineers responsible for the control and testing of heat-using plant.

"Temperature measurements are required in the routine control of industrial plant and in carrying out performance and acceptance trials," the code explains. "They are needed in obtaining energy balances in all thermal processes, particularly those involving combustion and heat transfer. The present code is intended to assist operators in selecting the most appropriate method of temperature measurement for any given case, to indicate the sources of error and limitations inherent in each method, and to formulate the precautions which should be observed. Wherever possible, an endeavour has been made to standardize materials and methods of construction of measuring instruments and the procedure to be followed, but such standards at the present stage must naturally be regarded as tentative only."

The first section of the code is a condensed version of the whole and is intended as an introduction for engineers without special training in this branch of physical science. Sections B, C, and D of Part One are intended to assist in the selection of the method of temperature measurement. Parts Two to Five set out in detail the construction and use of instruments for each of the fundamental thermometric systems. Part Six deals with the electrical instruments which constitute the necessary accessories to many thermometric methods. Parts Seven to Twelve are to a great extent incomplete and should be regarded as a mere sketch of the survey of thermometric problems encountered in industry. Part Thirteen, which deals with calibration, is largely based on the methods used at the National Physical Laboratory, adapted for use in industrial laboratories where methods of the highest precision cannot conveniently be employed.

*U. S. Army Signal Corps*

# Standardization of Radio Parts Aids Production

## Standards prepared by ASA War Committee on Radio are rushed into use by Armed Forces and industry as issued

by S. K. Wolf[1]

*Chief, Resources Branch,*
*Radio and Radar Division, WPB*

STANDARDIZATION and simplification of component parts of radio and electronic equipment is more important today than ever before. This equipment is now being produced in a dollar volume some 1500 per cent greater than that in the month before Pearl Harbor.

Only a limited additional amount of plant expansion can be provided to meet the tremendous needs of the Army and Navy for equipment ranging from tiny handie-talkies to complicated and bulky electronic apparatus. Some of this equipment had not even existed in the wildest dreams before American industry set to with a will and produced today's miracles in electronic research and development.

It is necessary, therefore, because of this limited plant expansion, to take the utmost advantage of our present production lines and tooling, as well as to stretch our available supply of labor by every possible means.

The use of standard components in equipment radically reduces the possibility of assembly-line stoppages due to shortages of special parts,

[1] Chairman, War Committee on Radio (C75).

tailor-made for individual equipment. It will also reduce the number of separate assembly lines necessary for practically identical equipment built for various purchasers but which differs chiefly in the minor details of the various components and sub-assemblies.

Likewise, the use of standard components means the elimination of small runs in the case of the parts manufacturers because of small orders for special parts. It also makes possible more extensive use of labor-saving automatic machinery by the various parts manufacturers because of the increased runs.

### Designers' Whims Abolished

With the use of American War Standard parts in radio and electronic equipment, component manufacturers will no longer have to comply with the whims of any designer who may have his own ideas of the specifications which should apply for parts used in equipment bought by the Armed Forces on the so-called "performance basis." Sometimes such whims have meant that constructions, tolerances, etc., have been insisted upon which have been unnecessary or have not been applicable for the required use in which the equipment was to be placed. In others it has meant that inadequate tests and designs have been called for which could not be quickly detected in the short time military necessity has sometimes allowed for equipment type approval tests in the government laboratories. This has resulted in failures and in necessary field modifications of equipment when the inadequacies have been discovered in actual military usage. That this has been a serious problem cannot be denied, since as a chain is no stronger than its weakest link so a radio equipment is no better than its least reliable component part.

The actual work of establishing the necessary standards for the component parts of military radio and electronic equipment is now being conducted by the War Committee on Radio of the American Standards Association. The membership of this committee comprises representatives of the U. S. Navy Bureau of Ships, the Signal Corps Standards Agency, the Headquarters of the Army Service Forces, the War Production Board, the Institute of Radio Engineers, and prime contractors for radio equipment.

### How Standards Evolve

Under the supervision of this committee, subcommittees and task groups, representing both the Armed Forces and industry, meet jointly around the table to draw up American War Standards. In these standards are included the minimum number of necessary electrical characteristics for each item chosen on the basis of preferred numbers; requirements for physical characteristics which use a minimum of strategic and critical materials; a test specification setting forth the tests and requirements necessary to insure satisfactory performance of the component under the terrifically severe conditions of temperature, humidity, vibration, and shock encountered in equipment used by the Armed Forces; and a type designation or part number for all standard parts. This number identifies all the essential physical and mechanical characteristics of the particular part as well as designating that they have been produced to conform with the particular American War Standard in which they are listed.

When the work of these task groups and subcommittees is finished, all important individual and radio components will be American War Standard components interchangeable between various equipment used by the Air Forces, the Ground Forces, and the Navy.

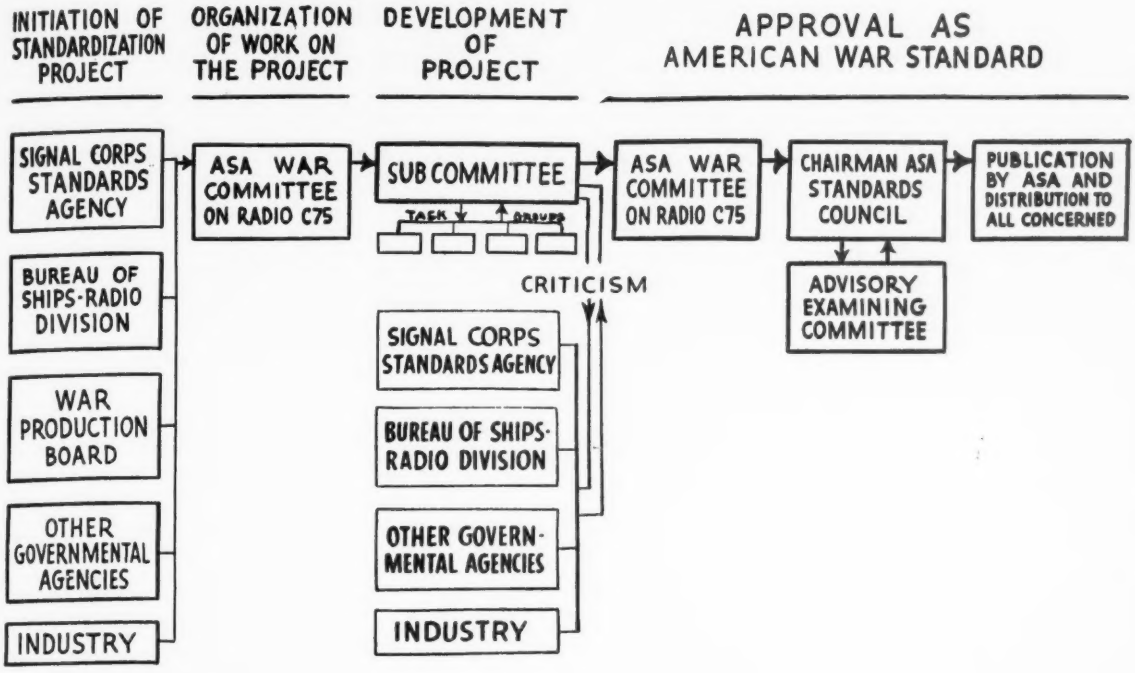
The advantages to both the Armed Forces and Industry of having these American War Standards, on which all interested parties have agreed as to the essential requirements for any individual component, cannot be counted in terms of dollars alone. On the fighting front the interchangeability of standard parts means that equipment which would otherwise have to be discarded because of lack of spare parts can be speedily repaired and returned to service. It means also a great improvement in the "spare parts problem," because no longer will the Armed Forces have to maintain large and diversified stocks of all spare components in field repair depots scattered from Iceland to Australia. Accompanying the lessening of demand for these special spare parts is a consequent freeing of component fabrication facilities for standard parts and a reduction in the amount of critical materials and parts destined for storage against possible use.

### Easy Interchangeability Results

The standard type designation given to all standard component parts means that these part numbers can be used for re-ordering, instruction books, circuit diagrams, etc., where in a few letters they identify the essential mechanical and electrical characteristics of a given part. It means also that the various Armed Services can obtain parts from each other's warehouses with but little trouble, since the parts will be identical even unto the numbers stamped thereon.

Another advantage of these American War Standards has already been realized. Standard component parts can now be and are being reallocated, as the need arises, from one equipment to another in order to keep production schedules in balance and to relieve sudden needs which arise as production schedules are altered because of changes in the military situation.

# DEVELOPMENT OF AMERICAN WAR STANDARDS FOR RADIO COMPONENTS




The work of the War Committee on Radio has evoked international interest among our Allies and its four American War Standards already approved are being used for lend-lease supplies and as a guide to the tooling up of production lines abroad. It seems probable that component parts of American equipment will in the not too distant future be directly interchangeable with those used and manufactured by our Allies. These four American War Standards are already in use in lieu of former specifications in the procurement of components and materials for radio and electronic equipment by both the Signal Corps and the Bureau of Ships.

### Simplification Conserves Materials

An instance of how far-reaching the recommendations for simplifications made by an ASA committee can be is the case of small panel-type electrical indicating instruments, such as voltmeters and ammeters where a reduction to 386 basic instruments in two case sizes was accomplished. The permissible variations of these instruments are only 4586, less than 5 per cent of the varieties previously furnished regularly by one large manufacturer. This American War Standard on Electrical Indicating Instruments, developed by an ASA committee headed by R. B. Shepard, Chief of the WPB Simplification Branch, has already seen use as a guide to WPB-sponsored plant expansion and tooling in the American instrument industry.

In the case of American War Standard on Fixed Mica-Dielectric Capacitors (C75.3-1942), the number of case sizes available was more than halved to 18. The standard ranges and characteristics were simplified to conserve huge amounts of strategic mica, much of which has had to be imported by air from abroad, and of critical low-loss molding material.

The other American War Standards already approved include one on Ceramic Radio Insulating Materials, Class L (C75.1-1943) and another on Ceramic Radio Dielectric Materials, Class H (C75.4-1943). The first of these will allow the use of a far greater number of materials than in present specifications used by the Armed Forces and thus contribute greatly to the opening up of the bottlenecks in the production of various ceramic insulators. The second specification is the first ever written for the materials used in ceramic dielectric capacitors which are coming into greater and greater use today both in precision frequency-determining circuits and as an alternate for mica capacitors.

The work of other subcommittees of the War Committee on Radio is progressing smoothly and efficiently. The draft standards for Fixed Ceramic Dielectric Capacitors and for Vibrators are in editorial preparation for printing for general canvass of the radio and electronic industry as

are similar standards for fixed wire-wound resistors and for wire-wound potentiometers and rheostats.

A draft standard for external meter-type resistors is now circulating in printed form for comment and criticism from industry.

A standard for steatite radio insulators will be finally approved and ready for use about June 15, it is expected.

Proposed standards for glass, glass-bonded mica, and porcelain radio insulators will be printed for general canvass after completion of the pilot work on steatite insulators.

A draft standard on high stability fixed wire-wound resistors is being revised and will be recirculated for comment from resistor and test instrument manufacturers before general canvass of the radio industry is taken.

### Work on Volume Controls Halted

Work on the draft standard for composition potentiometers and rheostats—the familiar volume controls of civilian radio—is temporarily halted as a result of lack of sufficient information as to the performance of these controls both on the part of the Armed Forces and the manufacturers. The work of the drafting group on this standard has revealed that the type of controls furnished in peacetime are not at all suitable for military usage. Manufacturers have undertaken an immediate research and development program on these controls and at the same time government laboratories are conducting tests on samples of various manufacturers, so that the limits set in the proposed standard will not interfere with production.

Various task groups are also working on drafts of proposed standards for crystals and crystal holders and on reference test circuits for testing these vital quartz freqency standards which are used today by the million where they were used by the hundred before the war.

A draft of a war standard radically simplifying the dynamotor situation, which was first prepared by an Army-Navy subgroup, is being reviewed and revised by a joint Industry-Army-Navy task group to bring it in accord with the situation as seen by the industrial representatives from a production standpoint.

Because of the special characteristics needed in communications and electronic equipment, new specifications for both thermo-setting molded, thermo-molding, and laminated-plate plastic materials are now being drawn up by another task group comprising representatives of the plastics industry, the Institute of Radio Engineers, the American Society for Testing Materials, and the Armed Forces.

In the offing to be activated as soon as possible are committees or task groups to set up standards for dry electrolytic capacitors, air dielectric capacitors, transformers, tube sockets, plugs and connectors, batteries, hookup wire, and solder and methods of soldering.

In all the standardization work of the War Committee on Radio, the cooperation between representatives of the War and Navy Departments and of industry has been whole-hearted and unceasing. Standards established on such a basis are not only sound from an engineering standpoint but also from a production standpoint, since both aspects have been considered during the progress of the standardization and simplification work and a satisfactory balance struck.

### Inspection Made Easy

Not the least advantage to both industry and the Armed Forces of these new American War Standards is the clear, concise instruction for sampling and inspection given in each standard, which should do much to end unnecessary controversies between inspectors and manufacturers.

Also important to both the engineers of the Armed Forces and the equipment manufacturers is the assembling for the first time in each standard of all the important design and usage data for the particular component under consideration. This information has only been available to a very limited number of engineers in the Armed Forces and in the laboratories of the largest equipment manufacturers. Now it is available to everyone who can properly make use of this information.

With the adoption of these recognized standards, design laboratories will be able to build preliminary shop models using standard parts from the start, thus saving much time on the part of production engineers when they find it necessary to redesign such early models for production purposes.

## Standards for Grading Wool

A new wool "package" has been developed by the Food Distribution Administration to serve as a blueprint for grading wool in accordance with Government standards. The package contains six samples of grease wool that conform to Department of Agriculture specifications for grade. With these samples, growers can send wool to the mills that is graded exactly in accordance with these standards.

## ASTM Lists Emergency Standards

A list of all Emergency Standards and Emergency Alternate Provisions issued by the American Society for Testing Materials up to April 15, 1943 is now available for distribution. Copies of this comprehensive list may be obtained by writing either to the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa., or to the American Standards Association, 29 West 39th Street, New York, N. Y.

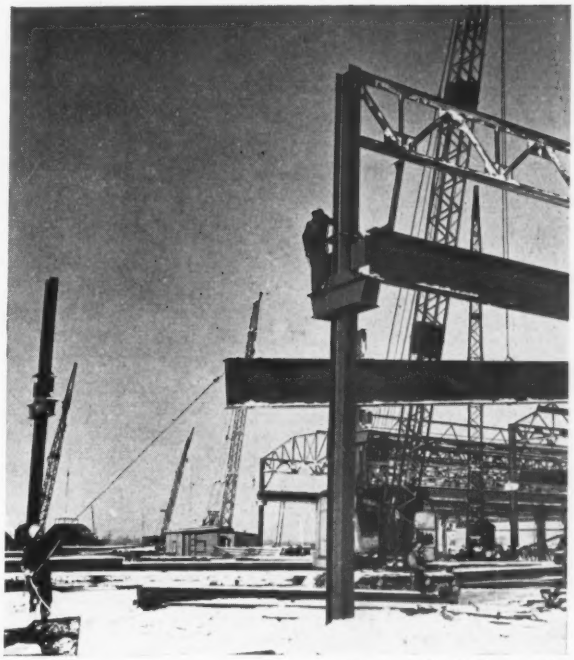
# Oregon Adopts Construction Work Safety Code

THE State Industrial Accident Commission of Oregon has recently adopted a safety code for construction work. The code, which was based on a draft standard prepared by the American Standards Association Committee A10, was written after a long and intensive study of accidents in the various operations. The many rules and regulations indicated have been designed to eliminate the causes of accidents.

Although the requirements enumerated are minimum, stipulation is made that these standards can be raised if found necessary to eliminate hazardous conditions. The Code is divided into fourteen parts:

Part 1—Safety Rules for Employees
Part 2—Demolition
Part 3—Excavation Work
Part 4—Piling
Part 5—Handling and Storing Materials
Part 6—Blasting
Part 7—Compressed Air Work
Part 8—Derricks
Part 9—Scaffolds
Part 10—Ladders
Part 11—Material Hoists
Part 12—Temporary Floors and Stairs
Part 13—Housekeeping, Temporary Wiring and Lighting, Temporary Sanitation, Salamanders, etc.
Part 14—Railings and Toe Boards

These parts are available separately or bound in one volume, and may be secured by application to the State Industrial Accident Commission in Salem, Oregon.



*American Institute of Steel Construction*

A final draft of the proposed American Standard on safety in construction is now being prepared for submittal to the ASA committee for final letter ballot action.

# Spanish Edition of National Electrical Code

The National Electrical Code, American Standard approved by the ASA in August 1940, under the sponsorship of the National Fire Protection Association, is being translated into Spanish and will be published in the near future for distribution in the Spanish-speaking nations of the Western Hemisphere.

The purpose of this Code is the practical safeguarding of persons and of buildings and their contents from electrical hazards arising from the use of electricity for light, heat, power, radio, signalling, and other purposes. It covers the electric conductors and equipment installed within or on public and private buildings and other premises, including yards, carnival and parking lots, and industrial sub-stations; also the conductors that connect the installations to a supply of electricity, and other outside conductors adjacent to the premises. It does not cover installations in mines, ships, railway cars, and automobile equipment, nor the installations used by a railway, electric or communication utility in the exercise of its function as a utility.

Credit should be given to John W. White for his efforts in bringing about the successful conclusion of the plan developed by the National Electrical Manufacturers' Association Committee on the Promotion of the National Electrical Code in South America. More than 50 member companies of NEMA supported the plan.

The price for the Spanish edition will be 50 cents a copy, plus postage charges. Final decision as to the number of copies will be made shortly before the edition goes to press. Since it is not planned to order any appreciable number beyond that subscribed for, it is suggested copies be ordered in advance. These orders should be addressed to the National Electrical Manufacturers' Association, 155 East 44th Street, New York, N. Y.

Official U. S. Navy Photograph

Standards for airplane parts and materials speed production and help with the replacement problem in the field.

# NASC Develops Standards for Armed Forces

THE Standards Engineers of the 29 airframe prime contractors of the United States held a five-day meeting of the National Aircraft Standards Committee in Hollywood, California, May 10 to 14 inclusive, and exchanged reports on the progress of standardization, collectively by the National Committee and individually within the member companies. One other national meeting is held each year in New York in November, in addition to the monthly meetings of the Eastern and Western Divisions.

The National Aircraft Standards Committee maintains permanent subcommittees, having supervision over the major departments of engineering design—Power Plant, Landing Gear, Electrical Installations, Hydraulic Installations, Equipment, etc. There are approximately 50 current projects for standardization, and an equal number of project surveys regarding the most critical problems for standardization, which have been proposed by the members to the Committees' Government Board. The membership of the Board is as follows:

Eric Dudley, Materials & Standards Engineer, Curtiss-Wright Corporation, Buffalo, New York, *National Chairman.*

David Craig, Jr., Standards Engineer, Grumman Aircraft Engineering Corporation, Bethpage, Long Island, New York, *Eastern Division, Chairman.*

Gordon Waite, Standards Engineer, Consolidated Aircraft Corporation, San Diego, California, *Western Division, Chairman.*

J. T. Thompson, Standards Co-ordinator, The Glenn L. Martin Company, Baltimore, Maryland, *Executive Member.*

Ed C. Wells, Chief Engineer, Boeing Aircraft Company, Seattle, Washington, *Executive Member.*

E. W. Norris, *Secretary* (Mr. Norris maintains the National Office under the Aeronautical Chamber of Commerce, in Washington, D. C.).

Since the last national meeting there have been numerous conferences with representatives of the Army-Navy Aeronautical Board, the Aircraft Scheduling Unit of the War Production Board, and other Government Agencies, for the standardization of raw materials. This includes sheet, bar, tubing, extruded and rolled strip shapes, and the wider use of formed sections in airframe design. The NASC has aided the Armed Services in the development of their own standards and specifications for materials and completed parts. The originator of a project survey uses telephone, telegraph, or air mail, which is direct and quick. Then follows a recapitulation of the replies of all members of the NASC and a recommendation to the National Aircraft Standards Committee Washington Office for NASC action or further recommendation to the Government Office concerned. The system is working well and is increasing in use, the Committee reports.

It is evident that the principles and practice of standardization is in ascendency, that men of higher qualification are volunteering, and are being assigned to the work by the industry, the committee notes.

# Refined Quality Control Speeds Up Production

by John Gaillard

*Mechanical Engineer,*
*American Standards Association*

## Part II

Part I of this article appeared in the April, 1943 issue of INDUSTRIAL STANDARDIZATION. The entire article was published in practically the same form in *American Machinist*, December 10 and December 24, 1942. Reprints may be obtained from the American Standards Association.

**The Quality Control Chart**—The quality control chart is a graphical record of quality comprising two control limits placed in a manner to be explained later. Data obtained from quality observations made on samples are plotted on the chart. If a plotted point falls *outside* the control limits, this should be taken as an indication of the presence of an assignable cause of variation (cause of trouble) in the production process. Thus, the quality control chart gives us a picture of the condition in the process and warns us when we must hunt for trouble. In this way, the control limits help us to classify causes of variation into the two groups mentioned—assignable causes, and causes that merit no investigation. Such a criterion, which aids us in deciding whether or not there appears to be lack of control, is absent in what was called, in the beginning of this article, the "traditional" method of quality control.

**Placing the Control Limits**—Suppose we want to judge whether or not a lot of product comprising a large number of units shows lack of control. If the distribution in the lot were normal, and if we measured the quality of each individual unit, we would expect to find that practically all of the units had a quality falling inside the 3-sigma limits computed for the lot.[4] If the quality in the lot is *not* controlled, however, and we measure the quality of each individual unit, we shall expect a number of observations to fall *outside* the 3-sigma limits.

If we do not measure the quality of every unit in the lot, but use sampling inspection, the central line and the 3-sigma limits of the lot remain unknown to us. However, we can compute the average of the sample qualities and their standard deviation from the average. Also, by means of formulas and tables given in the standards under discussion, we can compute in a simple manner, for any sample size $n$ (number of units in a sample), the 3-sigma limits that are to serve as control limits on the quality control chart.

A similar procedure can be followed to obtain control limits for the range ($R$), the fraction defective ($p$), the number of defectives per sample ($pm$), or the number of defects per sample ($c$). Recommendations for the use of one or more of these statistical measures in a specific case are given in the standard Z1.3-1942.

It will thus be seen that the new standards, developed through cooperation between the engineer and the statistician, enable the man in charge of quality control to construct a set of control limits that help him answer the question, "Is there lack of control?" in the same way as a set of gage limits helps the inspector of the product answer the question, "Is this piece acceptable?"

**Control Limits and Specification Limits**—Control limits are basically independent of the specification limits for a product. The latter, in the mechanical industry commonly called "manufacturing limits", are specified by the designer to indicate what is required, in his opinion, to make the product function correctly and to give it a reasonable length of wear life. Therefore, each unit of product (workpiece) must meet these limits if it is to be accepted by the inspector.

Control limits, on the contrary, are based on data obtained by inspecting units of product. They are statistical limits which represent, not what is desired of the product still to be made, but what has happened to the product that has been made.

The difference between specification limits and control limits is illustrated by Fig. 2 which refers to a workpiece whose outside diameter must be held between 0.9950 and 0.9980 inch. After a control chart has been kept for some time by taking samples of 4 pieces, the control limits

[4] By "practically all" we mean this: Since 99.73 per cent of the observations are expected to fall inside the 3-sigma limits, only 0.27 per cent of the observations, or about 3 observations in 1000, would be expected to fall outside these limits.

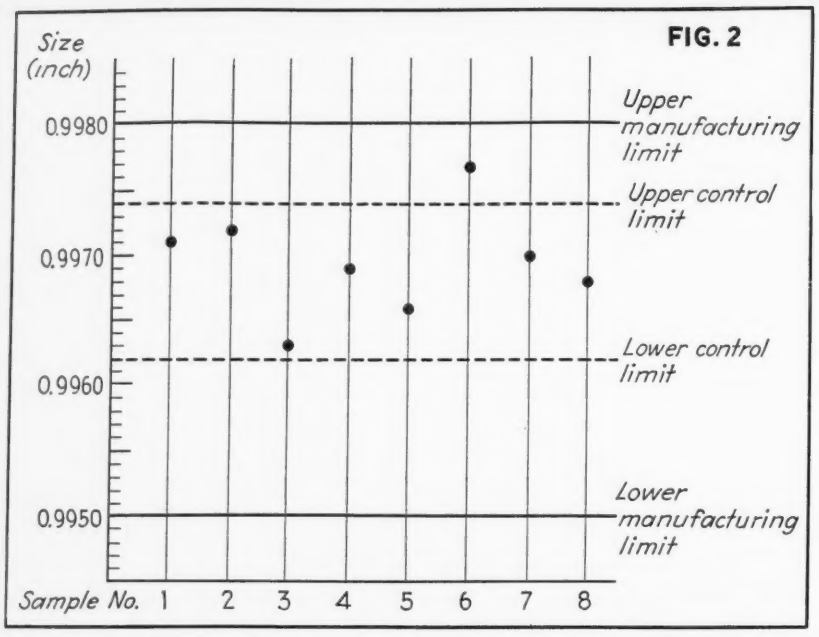



**Chart showing "manufacturing limits" specified for the quality required of each unit of product and "control limits" used for checking the collective quality of the product while it is being manufactured.**

computed for a certain period are 0.9962 and 0.9974 inch. They fall within the specification limits and so long as the plotted points remain inside the control limits everything may be assumed to run smoothly. The point plotted for sample No. 6 warns of trouble in the process. Yet, this does not necessarily mean that the quality of the product has been impaired to such a degree that there are rejections in the inspection department. Point No. 6 (sample average 0.9977 inch) may be the result of four readings: 0.9979, 0.9978, 0.9976 and 0.9975 inch, all of which lie below the specified maximum manufacturing limit. In such a case, the quality control chart forecasts potential rejections instead of reporting actual ones, so that the manufacturer has time to make the adjustment in the process necessary to prevent rejections.

**Use of Control Chart**—To get and keep control of his production process, the manufacturer periodically takes a sample from the product while it is being made—for example, one sample every half hour, or one sample every day, or again, one sample of every lot of 1000 as soon as completed. The size of the sample and the interval between two consecutive samples are to be decided on in each specific case.

Plotting the informative points on the control chart with the least possible delay enables the manufacturer to *take action* at once when quality appears to be disturbed. (For this reason, controls thus used are also called *action limits.*) By such action the occurrence of defectives will often be prevented because the basic trouble in the process is adjusted before its effect has grown to the extent that the quality of the product exceeds its specified manufacturing limits.

**Starting a Process Control Chart**—In Fig. 3 is shown how preparations for using the chart for control during production were made by taking 22 subgroups, each consisting of five observations, from the quality data recorded during the period from April 24 to 29 (left-hand side of Fig. 3). From these data, control limits were computed to be used as the initial set of limits for getting control of the process (right-hand side of Fig. 3). Starting on May 2, points were plotted from observations made on samples of $n$ units each, taken four times a day from the product as soon as it came from the line. The first 14 points remained inside the control limits, but on May 5, point No. 15 fell outside the limits, thus calling for action.

**Revision of Control Limits**—After a certain number of points have been plotted on a chart used for process control, the limits should be computed again on the basis of the new observations. A decision should then be taken as to whether the original set of limits should be conserved or revised. This check must be repeated from time to time and a compromise must be found between two requirements: the control limits must be checked often enough to be sure that they present a reliable picture of recent con-

ditions in the process and, on the other hand, each new set of limits must be based on a number of observations large enough to be duly representative of collective quality. How this compromise is reached is a question of engineering judgment for which no detailed instructions can be given. However, the standard Control Chart Method of Controlling Quality During Production (Z1.3-1942) gives a series of illustrative examples which the user will find helpful in this and other respects, in solving his own problems.

**Catch Trouble Early**—The quality of any individual unit of product depends directly on the conditions existing in the process at the time that unit was made. Since the sooner we know that something has gone wrong with the process the better is our opportunity for adjusting it, the control chart should be kept at that point in the production process which is closest to the potential source of trouble. In one large plant manufacturing fire arms and ammunition, a control chart has been put on every production machine.

**Other Advantages of Control**—Wide practical experience has shown that once the assignable causes of variation have been weeded out and process control has been attained, there is no use in trying to keep variation in quality within still closer limits. This knowledge is useful, for example, to the manufacturer who would like to change from selective fitting to assembly of interchangeable parts. This change requires a narrowing of the manufacturing limits. Without the statistical approach, the only way to find out if this can be done is by trial. If an effort in this direction is unsuccessful, the manufacturer has to decide whether or not he should keep on trying. If he does, and finally fails, he is back where he started from and has wasted time and money. The control chart method, however, enables him to decide in advance whether he can reduce the manufacturing tolerances sufficiently by adjusting the process in use or whether this can be done only by making basic changes in the process.

**Maximum Reliability of Samples**—When quality is controlled, it is more probable that a sample will present a reliable picture of the quality of the lot from which it was taken than it is when quality is not controlled. This fact is very important where inspection by sampling is the only practical way of judging quality. Without control, we may get samples whose quality deviates so much from the quality of the lot as to create confusion, and as a result disagreement between the party supplying the lot and the party receiving it—whether these parties be a supplier and a purchaser or two departments of the same manufacturing concern. When control has been established, samples are so much more reliable that sampling inspection can often be used effectively and with considerable saving in cost, where 100 per cent inspection has been necessary so far.

**Supplier-Purchaser Relations**—An arrangement of great benefit to the supplier and the purchaser alike is one in which the supplier uses the control chart method for keeping control of his process and places his quality records at the disposal of the customer for the latter's information. The customer will then have evidence of the continuous reliability of the quality of the product supplied. He may safely forego rigid inspection of every shipment received, since he

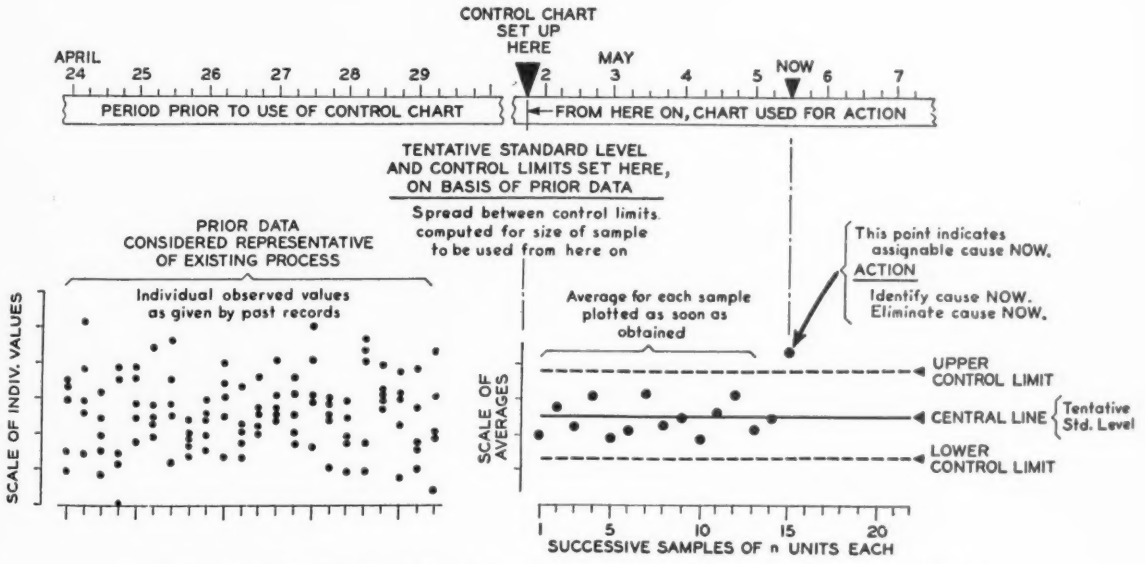



**Fig. 3. How quality data from past records serve for starting a control chart used for controlling quality during production (control of process).**

knows that the supplier, in making the product, has already used the most effective kind of quality control available. All the customer requires here is to take an occasional sample to make sure that the supplier has kept up his process control.

This supplier-purchaser relationship is of great value, for example, in subcontracting arrangements now widely used in war production work. Here, the control chart method not only helps the subcontractor reduce his per cent defective, but also creates a better understanding between himself and the prime contractor.

**Increasing Use of Control Chart**—The U. S. War Department is using the control chart method extensively in the arsenals, and encourages its use by private industry. This technique is thus becoming an important factor in the war effort of this country and, also, in Great Britain, Australia and Canada, where the American War Standards in this field have been adopted by the respective national standardizing bodies.

It is recommended that industrial executives give the new standards on Quality Control their attention and have them applied without delay to the repetitive processes used by their companies. Often the inspection data that are being collected in a manufacturing concern as a matter of routine for checking the quality of individual units of product are sufficient for the application of the control chart technique. These data can then be used to much better advantage, without increased cost of inspection. In some cases the cost of inspection may even be reduced. Therefore, the introduction of the new standards into practice should be most attractive to those in charge of industrial operations—especially at a time when this novel and refined method of quality control can make a major contribution to the winning of the war.

Copies of the quality control standards approved by the American Standards Association as American War Standards may be obtained from the ASA. The first two, American War Standard Guide for Quality Control (Z1.1-1941) and American War Standard Control Chart Method of Analyzing Data (Z1.2-1941), are published in one pamphlet at 75 cents. The third, American War Standard, Control Chart Method of Controlling Quality During Production (Z1.3-1942), published separately, is also available at 75 cents per copy from the American Standards Association.

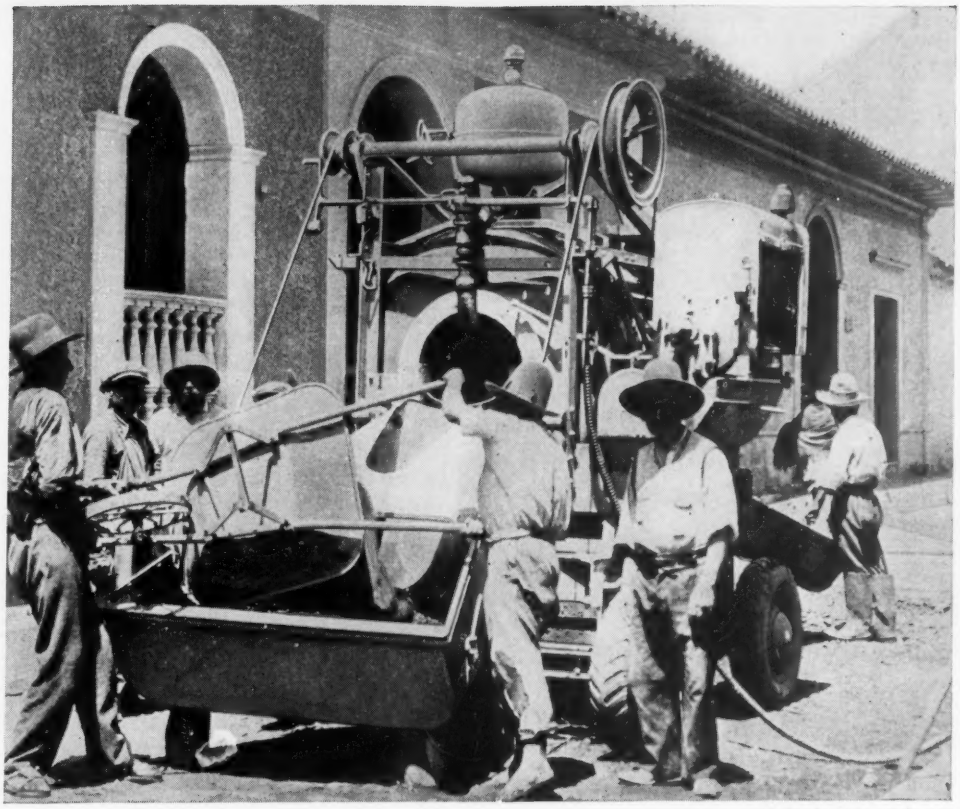
# Building Code Requirements Recommended for War Housing

IN a report entitled *Recommended Building Code Requirements for New Dwelling Construction With Special Reference to War Housing*, just issued by the National Bureau of Standards, a representative committee drawn from the Federal agencies most concerned with housing presents its recommendations for improved requirements.

This report which is designated as BMS88 is recommended to those seeking the advice of Federal agencies as to proper building code requirements in areas not now having such requirements, as well as to those who are revising or adopting local building codes. The requirements contained in the report apply to single- and two-family houses and to multiple dwellings of limited height, and cover such matters as fire resistance, light and ventilation, exits, strength of construction, and chimneys and fireplaces. In general, good practice is required, certain well-recognized standards and specifications being cited as acceptable evidence that this is being followed. In this connection it may be pointed out that the American Standards Association has approved many standards and specifications in the building field.

Building code requirements can be legally effective only when they call for the minimum that is necessary for safety and health. This places such requirements in a different class from other standards, which properly take into consideration expected life, comfort, livability, good taste, and other matters that are socially and economically desirable but cannot legally be required. An appreciation of this distinction should help to clear up some of the confusion that exists regarding apparent inconsistencies between building standards and building code requirements.

Periodical revision of the report is planned; and criticism and suggestions for improvement are invited. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 20 cents.



*Guia de Importadores*

**A modern cement mixer paving the streets of a Bolivian town.**

# New Developments in Inter-American Standards Program

TO carry forward the work of the new Inter-American Department of the American Standards Association, Cyrus T. Brady, Jr, ASA's field representative with headquarters in Buenos Aires, recently visited the more highly industrialized countries of Latin America. As a result of his visit considerable information has been gathered about standardization activities there, and liaison representation has been arranged between the American Standards Association and standards organizations in Argentina, Brazil, Mexico, and Uruguay.

M. E. Souza, assistant to the president of the General Electric Company in Brazil, has agreed to act as liaison representative between the American Standards Association and the Brazilian standards organizations. Members of the American Standards Association will be interested in the article prepared by Mr. Souza for publication in *Brazilian Business*, the official magazine of the U. S. Chamber of Commerce in Brazil. The article tells something about the work being done by the different organizations which are important in developing standards in Brazil. (See page 161, this issue.)

C. L. Van Domselaar, manager of the U. S. Chamber of Commerce in Uruguay, is being named ASA liaison representative with the Uruguyan standardizing body.

In Mexico, a special committee headed by K.K. Boynton, vice-president of the U. S. Chamber of Commerce there, will serve as liaison between the ASA and the Direccion General de Normas Nacionales, government department organized in January 1943 to centralize standardization activities in Mexico.

Mr. Brady reports that standardization is growing as an active movement throughout Latin America. Proposals for setting up a standardizing institute are under consideration in Chile, and in Peru the possibility of organizing a stand-

ardization program is being investigated. In Mexico, the new Bureau of National Standards (Direccion General de Normas Nacionales) plans to prepare standards for articles which are purchased in large quantities by the Government itself (*e.g.*, shoes for the army) as well as carrying forward an extensive program covering the entire range of standardization.

A South American Committee for Technical Standards was set up by the Union of South American Engineering Societies in 1941. Mr. Brady declares, "Although it is frankly admitted that progress in this difficult and delicate task will be slower than in each individual country, the mere existence of the Committee is already acting as a stimulus throughout the Continent."

### Standardization Activities Grow

In reporting on his trip through Latin-America, Mr. Brady told the American Standards Association:

"The Western Hemisphere is now so united in economic, political, and cultural intercourse, that any striking development in one country is apt pretty shortly to be reflected in the others. This is particularly conspicuous at the present moment in our field of standardization. As a rule, however, the American business and technical men stationed in the more highly industrialized republics first became aware of the movement as a local occurrence. It is only when reports from all over the hemisphere are assembled in one place or when a trip is made over the whole area, that one can envisage how widespread and simultaneous is its action.

"Thus some six or seven years ago, when Argentina and Brazil organized national standardizing institutes, it seemed to most dwellers in both countries as if each of these departures were an isolated event although it was recognized that the constantly developing industrialization was full warrant for the undertaking. Naturally, South American engineers and scientists were better informed continentally, and they soon commenced to exchange visits and ideas. But to this day some of the foreign residents of these countries, including business men who may be directly concerned by local standards, insufficiently appreciate the fundamental causes that have called them into being. Only two years ago Uruguay's organization of its own standards institute was interpreted by a few foreigners as manifesting the desire of Uruguayan professional men to emulate what was going on in the large neighboring countries, rather than as a convincing sign of the times.

"Yet no real doubts of the universality of the movement should have remained after the meeting of the Union of South American Engineering Societies, held in Rio de Janeiro in October 1941, at which nearly all the republics of the Continent were represented. After searching discussion there was finally created a 'South American Committee for Technical Standards'; thoughtfully elaborated bases of action were agreed upon, and a tentative set of regulations to govern the work were adopted. . . . .

### Foresee Western Hemisphere Standards

"Hemispheric solidarity is an ideal which bulks very large at the present moment. Some of the men who have been most active in promoting the South American Committee for Technical Standards, believe that it is not utopian to foresee the day of Western Hemisphere Standards. Everywhere there is friendly interest in American Standards, and information about them is gladly received. There could be no more favorable time for the promotion of better mutual understanding in these respects."

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## Hemispheric Standards?

**The following editorial is reprinted from the *New York Sun*, March 22, 1943:**

"One of the apparent certainties of the postwar period is an intensive effort to develop the industries of several Latin-American countries. Recently, while visiting Uruguay, Eric Johnson, president of the Chamber of Commerce of the United States, predicted that a number of factories in the United States now used for war-goods production would later be dismantled and moved to towns and cities in Latin America.

"If Mr. Johnson's forecast should be realized one result would undoubtedly be a considerable impetus to the movement to extend standardization throughout industrial sections of South American countries. Recently the American Standards Association reported that its field representative, Cyrus T. Brady, Jr., had observed signs of such extension on a trip through South America. He cited the existence of a committee for South American Standards, which, though it is not yet active, may help co-ordinate some of the more essential technical standards long established in industry in the United States.

"It is of considerable importance not only to trade between the United States and Latin America, but also to trade among countries of Latin America, that suitable standards for such things as machine parts, factory buildings, fuels, railroads, textiles, and chemical raw materials be adopted by business in the southern continent. Whatever part the United States chooses to take in this effort will require careful organization and several years of work."

# How Standards Are Developed In Brazil

by M. E. Souza[1]
*ASA Representative in Brazil*

NOTE: This article is abstracted from an article by Mr. Souza which originally appeared in *Brazilian Business*, the official magazine of the U. S. Chamber of Commerce in Brazil.

EFFORTS to obtain some sort of standardization of materials manufactured or used in Brazil date back at least to 1925 when the Federal Government appointed a committee to study standardization of various railway materials. It was not until 1930, however, when the National Institute of Technology (Instituto Nacional de Tecnologia) was established in Rio that the movement obtained the support necessary for the successful realization of the standardization program which many industrialists, technicians, and others had for many years tried unsuccessfully to bring about. At about the same time the Institute of Technological Research of São Paulo (Instituto de Pesquisas Tecnologicas), with the encouragement and support of different industries of that State, started to carry on research and testing of some raw materials and manufactured products. Thus they attempted to fix tentatively quality standards and standard methods of testing. A number of the Federal Government Departments also began to draw up specifications covering materials for their own use.

Finally, in 1937, the Instituto Nacional de Tecnologia took the initiative and succeeded in sponsoring the first meeting of all the organizations, laboratories, and individuals interested in the development of standards for specifying and testing raw materials and finished products. It was on the occasion of this meeting that the first standards of a national character were approved. Subsequently a number of these first standards were given official status by Federal Government decree.

## ABNT

The 1937 meeting demonstrated that worthwhile results could be obtained, and therefore similar meetings were planned and held in 1939 and 1940. It was on the latter occasion that the Associação Brasileira de Normas Tecnicas (ABNT) was formally organized for the purpose of coordinating all standardizing work throughout Brazil. It was also intended to act as a clearing house for the exchange of all available information and for the promotion of nationally acceptable standards of specifications for materials and testing methods best suited to local conditions.

The ABNT is composed of three general classes of members: corporate, official or semi-official institutions, and individual. At the beginning of 1943, the membership included some 150 corporate, 100 official institutions, and 550 individuals. The Directing Council is composed of 12 individual members, three representing the Laboratories, and three representing the individual members as a group. The affairs of the association are governed by an executive board

São Paulo—a modern business center of Brazil.

[1] Assistant to the President, General Electric Company, S.A., Rio de Janeiro, Brazil.

**Brazilian skyscrapers are sheathed with boards during construction to protect passersby.**

of directors chosen from the members who make up the general directing council.[2]

In actual practice the time taken to develop a standard may run into several years because of the procedure that must be followed. This provides that the proposal to develop a standard be first submitted at a general meeting for consideration as to whether it can properly be sponsored by ABNT, and whether it is of sufficient importance. If the preliminary proposal is favorably acted upon, a first draft of the proposed standard is prepared by the committee for submittal at the following general meeting. However, it is only at the third meeting that final formal approval may be given, under the ABNT rules of procedure.

Outside of the committees, all the formal discussions and approval of standards take place, as a rule, during the Annual Meeting of the ABNT. The fourth of these meetings was held in October of 1941 in São Paulo, and the next one, slightly delayed by conditions resulting fr the war, is scheduled to take place before t end of this year.

[2] The procedure followed by ABNT in developing standards was described by Dr. Palo Sá, secretary of ABNT, in an article published in INDUSTRIAL STANDARDIZATION, March, 1942. The section in Mr. Souza's article which gives similar information has therefore been omitted here.

### Developments to Date

The standards issued by the ABNT cover n only material specifications but also methods employment and methods of testing in a lar variety of fields. The ones issued to date concer electrical installations, cement, sand, concret concrete mixtures, ceramics, metals, pipes, an coal. Several others are going through the prep ratory stages indicated above. Further detail information may be obtained by applying t ABNT headquarters.

In addition to the Instituto Nacional de Te nologia, other laboratories have collaborated wit ABNT in the preparation of specifications. Amon these, outstanding work has been done by th Instituto de Pesquisas Tecnologicas (IPT) o São Paulo; and several government laboratorie of different civil and military departments hav contributed in no small measure in this direction These laboratories have developed their facilitie to such an extent that it is now possible to con duct tests in the fields of (1) inorganic chemica industries; (2) organic chemical industries; (3) metallurgical industries; (4) civil engineering works; (5) fermentation processes; (6) textile industries; (7) fuels; (8) electric equipment and instruments, and others.

### IPT and IE of São Paulo

Of outstanding importance because of the comparatively large number of specifications developed to date is the IPT (Instituto de Pesquisas Tecnologicas) of São Paulo. Although it is concerned primarily with the interests and requirements of the State of São Paulo, much of its work has received national recognition and often serves as the basis for national standards. This Institute has already issued standard specifications of approximately 70 different materials and about 30 standard methods of testing covering mainly cement, steel, oils, bricks, lumber, paints, disinfectants, textiles, metal wire, screws, and acids. It has one of the best equipped materials-testing laboratories in South America.

The IE (Instituto Elecrotecnico), which is connected with the Escola Politecnica de São Paulo in much the same way as the IPT, was created in 1940. It has since developed intensive research work in the field of electricity, and has contributed in an effective manner to the establishment of present standards for electrical installations and devices.

### Government Collaboration

The Federal and the various State Governments participate through their representatives in the development of many standards with a view to adopting such standards for their purchasing of

materials. Just recently, arrangements have been concluded whereby ABNT is charged with the preparation of standards related to certain government services. In addition to this and owing to the special circumstances brought about by the war, the Department of the Coordinator of Economic Mobilization has entrusted the ABNT with the preparation of emergency standards to meet the requirements of Brazilian industrial war effort. Among others, it has prepared, or is in the process of preparing, specifications covering safe moving loads for railway bridges, safe moving loads for highway bridges, structural calculation for buildings, revision of specifications on reinforced concrete construction in consideration of the present difficulties in obtaining steel rods and cement.

### ABNT—Branch Office

Taking into consideration the industrial magnitude of São Paulo area, the ABNT established a branch office in that city in March 1942 and is thus better able through its special local representative to maintain a close contact with the IPT and the many industries. This branch office has developed proposed specifications covering various articles. Among the most important of these are the ones referring to: paper (standardization and simplification of sizes and designations); tiles and bricks (standardization of types and methods of testing); refractory materials (methods of testing and designation); technical drawings (sizes and symbols); and rubber products including some 15 different specifications relating to various components which enter into their manufacture. Studies have also been made covering specifications of vegetable oils, electric wire and cables, storage batteries, textile fabrics, low voltage insulators, as well as on other products for the Coordinator's Department.

### Interchange of Information

There is a definite desire on the part of the leaders in the standardization field in Brazil to receive information based on experience gained in other countries in the application of standards to general practice. Information which throws light on any special set of conditions under which the standards were developed is especially welcome. Therefore, any suggestions which will aid in facilitating and encouraging the development of new, or the improvement of existing standards, are always accorded the merited attention. Considerable material has already been contributed by such organizations as the American Standards Association, the American Society for Testing Materials, the National Bureau of Standards, as well as the U. S. Department of Commerce.

With the recognition of the increasing importance of standards in the industrial development of Brazil, it is probable that even greater interest in standardization will develop. It therefore seems opportune to recommend that American business in general endeavor to participate actively in these developments by contributing from its large store of experience in the design, manufacture, and use of products or methods.

In addition, opportunity is offered for specialized contributions on specific subjects, and it is in this manner that the efforts of the qualified and experienced individuals, who are willing to give their time and knowledge, or who are willing to conduct the necessary experimental work, are most greatly needed and appreciated.

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# Latin-American Standardization Activities

## Brazil

Dr. Ary Torres has recently been appointed head of the Bureau of Industrial Production in the Department of Coordination of Economic Mobilization. Dr. Torres is president of the Associação Brasileira de Normas Técnicas (ABNT) and of the Instituto de Pesquisas Tecnológicas de São Paulo (IPT), the standardizing bodies in Rio de Janeiro and São Paulo respectively.

The Bureau which Dr. Torres now heads is actively collaborating with ABNT in promoting emergency technical standards.

## Mexico

A Bureau of National Standards (Dirección General de Normas Nacionales) has been created in the Mexican Department of National Economy for the purpose of centralizing all standardization activities in that country. This Bureau, which replaces the former Bureau of Weights and Measures, is headed by the following officials:

Ing. Ignacio Aguerrebere, Director
Ing. Manuel Torres Torija, Assistant Director
Ing. Manuel Teja Zabre, Chief, National Standards Division

In order to facilitate cooperation between DGNN and the American Standards Association, K. K. Boynton, of the U. S. Chamber of Commerce, has formed a committee to act as liaison. This committee includes:

K. K. Boynton, American Chamber of Commerce, General Electric Company, *Chairman*
E. F. Miller, Westinghouse Electric International Company
A. H. McClellan, Standard Sanitary Manufacturing Company
B. Nikiforoff, Mexican Light and Power Company

# WPB Conservation Division Is Reorganized

A REORGANIZATION of the WPB Conservation Division has just been completed. Under the new set-up there will be two basic branches of the work—one on Materials, and one on End Products.

Most of the work of the Division is in the nature of standardization—emergency standards and emergency changes in existing standards to help industry change from a peace-time economy to a war-time economy. These standards have to do both with materiel for the Armed Services, and with supplies for the civilian population.

Formerly the Division had been organized in three sections in accordance with the type of standard handled—one on Specifications, one on Substitution, and one on Simplification. Experience showed that the work could be handled more simply and with a minimum of duplication between branches if it were organized in accodance with the product dealt with. Hence the division into materials and end products. Each section will handle its own conservation, specifications, and simplification problems. Thus, these operations will relate directly to materials and to products, and will clear through the various technical consultants working in specialized industrial fields.

Howard Coonley, head of the Conservation Division, says that the new arrangement will result in greater coordination of the assistance given to industry by the Division consultants, as each consultant will be familiar with both the situation in regard to materials and development of the product in each case.

Each consultant will continue to be responsible for conservation planning and for working with a specific field of industry. Sixty-four of the 96 consultants in the Division are trained technicians experienced in specific industrial fields. The average span of specialized experience of the Conservation Division staff is 20 years per man.

The change in set-up has involved new supervisory assignments. Harvey A. Anderson, formerly Chief of the Conservation and Substitution Branch, becomes Deputy Director of the Division; C. L. Warwick, who has served as Chief of the Specifications Branch, becomes Chief of the new Materials Branch; while R. B. Shepard, formerly Chief of the Simplification Branch, becomes Chief of the new Products Branch.

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# ASTM Issues Compilations of Standards

Two additional compilations of ASTM standards (see INDUSTRIAL STANDARDIZATION, April 1943) have been issued by the American Society for Testing Materials. These books include all of the standards issued by the ASTM in the particular field covered. They are:

*ASTM Standards on Copper and Copper Alloys,* prepared under the sponsorship of Committee B-1 on Copper and Copper Alloy Wires for Electrical Conductors, B-2 on Non-Ferrous Metals and Alloys, and B-5 on Copper and Copper Alloys. Includes more than 85 standards, as well as the emergency alternate provisions and emergency specifications developed to aid in expediting procurement. $1.75

*ASTM Standards on Rubber Products.* Includes 41 specifications and physical and chemical tests for a wide range of rubber products, as well as emergency alternate provisions and other emergency methods issued to expedite procurement and conserve crude rubber. Prepared by Committee D-11 on Rubber Products. $1.75

Copies of each publication at the prices indicated may be ordered from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa.

# Standard Methods for Testing Petroleum

The British Institute of Petroleum has recently issued the fourth edition of its Standard Methods for Testing Petroleum and Its Products. Since the stock of the third edition was destroyed by enemy action in 1941, it became necessary to speed up the preparation of the present edition.

This fourth edition has been considerably revised and enlarged, and includes all test methods which are required in official specifications, particularly those of the Navy, Army, and Air Force.

Also in the new edition, the section on viscosity has been considerably expanded, particularly as regards the methods for determining kinematic viscosity.

The tests are as closely as possible in accord with those of the American Society for Testing Materials, several having been drawn up by ASTM Committee D-2.

A copy of *Standard Methods for Testing Petroleum and Its Products* is on file in the American Standards Association library.

# Standard Symbols for Electrical Power and Control Diagrams

by James W. Cooke

*Industrial Control Engineering Department*
*General Electric Company*

DURING the present war emergency there is need for vast quantities of electrical apparatus for use in all parts of the world. This ever-increasing amount of equipment must be designed, manufactured, installed, and put into operation with a minimum of delay, and often with new and unskilled personnel.

To promote maximum efficiencies and economies in the production of this equipment, it is essential that there be standardization and uniformity in engineering and manufacturing practices. This is particularly true in the case of the many wiring diagrams and other drawings which are required.

It is important that the symbols used in the preparation of these diagrams be not only simple and clean-cut in appearance and easy to follow and understand, but also that the same fundamental symbols be used by different electrical manufacturers and others in the preparation of such drawings.[1]

General use of the symbols shown in the new American Standard for Electric Power, Control, and Measurement will be of material assistance in our over-all war production program.

Wiring diagrams are prepared by engineers, designers, and others as they develop electric systems for different applications. Diagrams enable the factory wiremen to make the proper connections between devices on the backs of panels, and installation men to run the necessary wires and cables between panels, resistors, master switches, circuit breakers, motors, and other equipment. They serve as instructions for testing and checking and are particularly helpful when "trouble shooting," and when changes become necessary in operation. Diagrams serve as a record of the electric equipment installed and, as such, aid in future improvements and developments.

In the early days of the industry, electric equipment was relatively simple. Control usually consisted of a knife switch and a manual controller or circuit breaker, and it was possible to use words to convey to others information about its use. As the use of electric apparatus grew in scope and complexity, it became more and more necessary to devise a special shorthand system for describing such apparatus. This led to the development of a pictorial sign language. Symbols were used to represent contractors, relays, circuit breakers, motors, and other apparatus. Solid lines were used to indicate the power and control wiring between different devices. Drawings using this symbolic sign language were called "connection" or "wiring" diagrams.

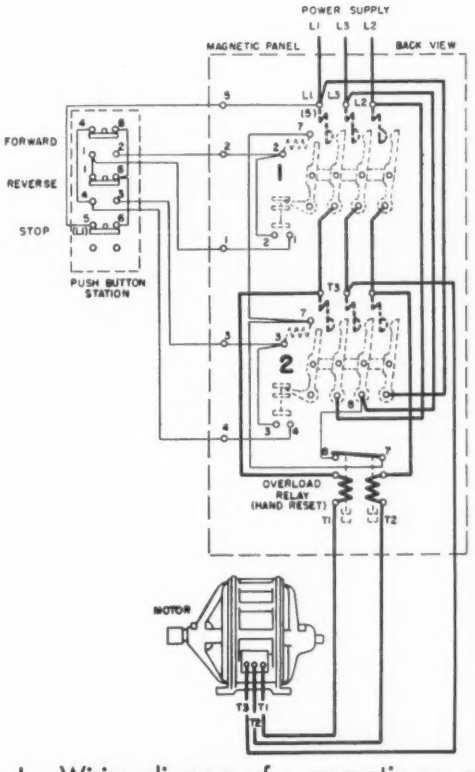



**Fig. 1. Wiring diagram of a magnetic a-c controller drawn using symbols of twenty-five years ago.**

It was natural for each manufacturer of electric equipment to develop a set of symbols based upon the physical construction of his own line of products. In the beginning, such symbols were practically outline drawings of the devices and motors themselves and included mechanical as well as electrical details.

As equipments increased in size and complexity, each manufacturer found it necessary to simplify his drawings so that they could be more readily prepared and more easily understood without de-

[1] See the article by W. L. Heard, *Electrical Symbols for Use on Communication Drawings*, which appeared in INDUSTRIAL STANDARDIZATION, November, 1942.

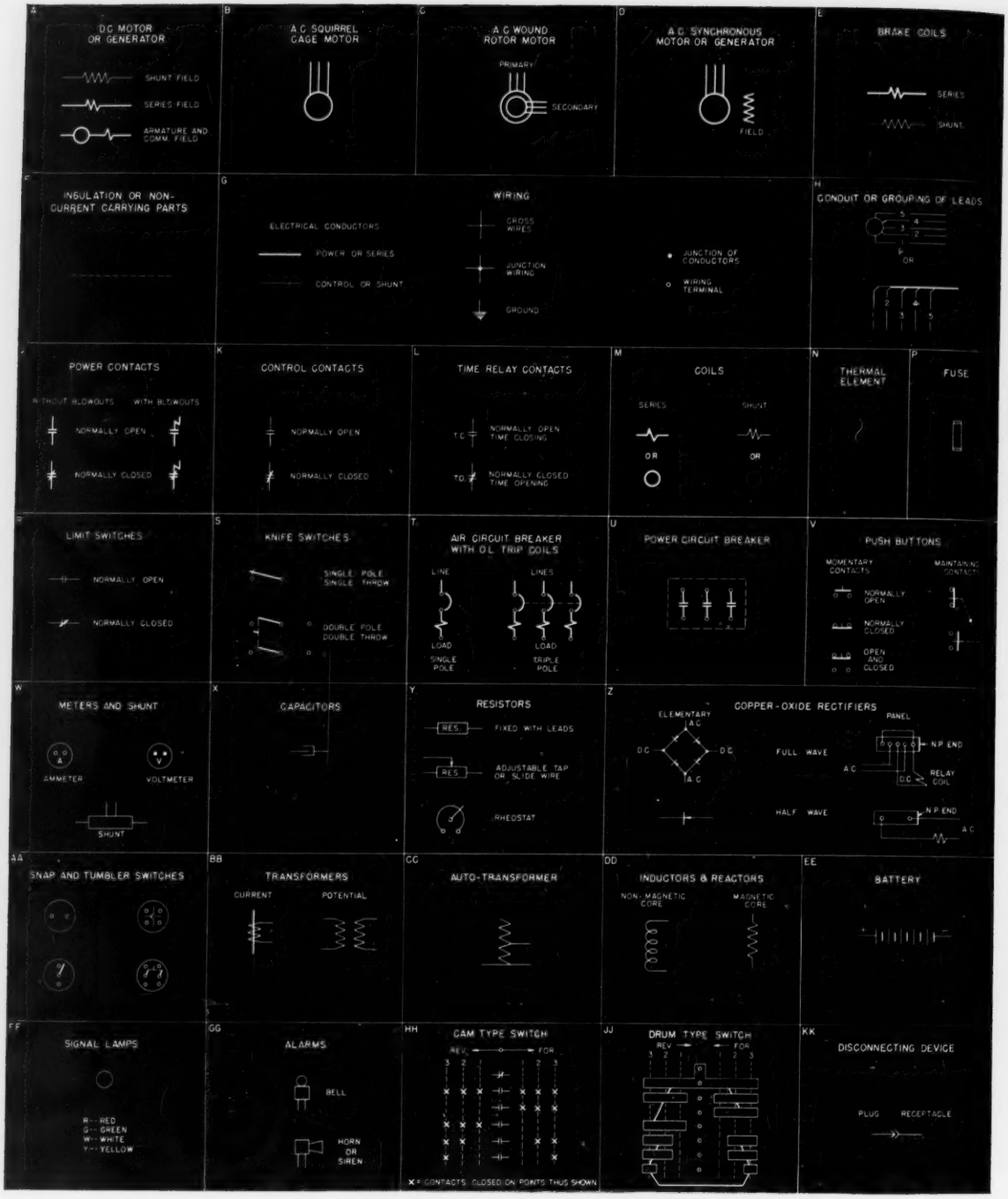



**Fig. 2. Typical fundamental symbols and a few adaptations for wiring diagrams.**

tailed written instructions. One of the first steps in this simplification was to omit unnecessary mechanical details from device symbols. There still remained, however, a distinct difference between diagrams for similar types of equipment built by various manufacturers, due to variations in the individual symbols used.

These differences in wiring diagrams became quite noticeable as users began to install in their plants more and more equipment of various manufacturers. It was necessary for plant engineering and operating personnel to become familiar with a large number of symbols. To improve the situation from the standpoint of their men, certain users would take the diagrams received from the manufacturers and make up new drawings based, in some cases, on a symbol system of their own. This was undesirable because of the additional drafting time and expense involved and the introduction of still another set of symbols. This

condition emphasized the differences in wiring diagrams and the necessity of a universal standard of readily understood symbols.

Fig. 1 illustrates the connections of a typical a-c reversing magnetic controller drawn in the manner which was common practice twenty-five years ago.

Early symbols used in the preparation of wiring diagrams had three chief disadvantages. First, diagrams were more complicated than necessary and were difficult to check and understand because both mechanical and electrical details were shown. Second, these same details, such as contactor shafts and armatures, motor frames and the like, made diagrams difficult to draw and required considerable drafting time. Third, there was a marked dissimilarity between diagrams for similar types of equipment built by different manufacturers. This put an extra burden on the personnel in users' organizations, especially in engineering, maintenance, and operating departments, as it was necessary for them to become familiar with a different symbol system and diagram arrangement for each make of equipment.

Following the issuance of American Tentative Standard Z10g2 in 1933, a group of industrial control manufacturers started work to prepare a universal standard of readily understood symbols. They surveyed the industry and with switch-gear manufacturers, arrived at a standard based on the principle of a fundamental symbol for each component part of an electric device.

By using these fundamentals, the maker of a diagram can create a symbol for any device or unit of equipment. From these symbols a wiring diagram for any standard or special group of devices or equipment can be prepared without changing the universal sign language.

To obtain national acceptance of this symbol and wiring diagram standardization, the American Standards Association appointed a committee to carry on this work. This has resulted in the new American Standard Z32.3-1943 which covers Graphical Symbols for power, control, and measurement.

Some of the most frequently used fundamental symbols and certain typical adaptations are illustrated in Fig. 2.

### Universal Set of Symbols

The primary objectives in the development of the new symbols are to provide a universal set of fundamentals from which symbols for complete devices can be prepared; to provide device symbols readily understood and easily followed during wiring; and to make symbols as simple and clean-cut as possible, both from the standpoint of the drafting time required to draw them and overall appearance.

Any standard as broad in scope as this must of necessity include certain alternatives. The idea of the ASA committee is that commercial use will

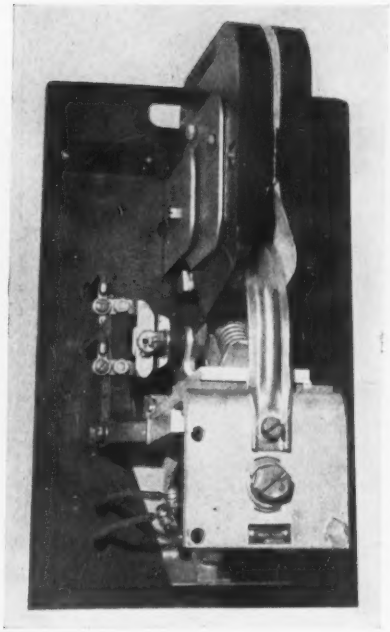


Fig. 3 (left). Single-pole d-c contactor with normally open electrical interlock.

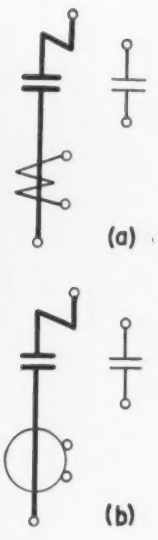



Fig. 4 (right). Back-view diagram symbols for single pole d-c contactor with interlock. (a) and (b) illustrate alternative symbols for shunt coil.

in time make the one or the other arrangement obsolete.

An example of an alternative arrangement for symbols is shown in plate "M" of Fig. 2. Here are illustrated two fundamental symbols for coils. One consists of a zig-zag line, the other a circle. Either symbol may be used. It is common practice, however, to use only one of these alternatives in the preparation of a given diagram or group of diagrams for a single installation.

In Fig. 3 is illustrated a single-pole d-c contactor with an electrical interlock. By using fundamental symbols from plates "J," "K" and "M" of Fig. 2, it is easy to develop a complete symbol for the contactor. In the preceding paragraph, it was pointed out that coils may be represented by either one of two fundamental symbols. These two alternatives are included in the contactor symbols shown in Fig. 4. A zig-zag line represents the coil in cut (a) and a circle represents the coil in cut (b). These are back-view symbols of the device. The main pole is shown by heavy lines and the inter-lock and coil circuits by light lines. Terminals indicate where power and control connections are to be made.

A six-circuit, three-position, reversing cam type master switch is illustrated in Fig. 5. The cover has been removed to allow the contacts, terminal board, and cams to be seen. The manner in which this switch is shown on a wiring diagram is indicated by the two symbols shown in Fig. 6. The symbol in cut (a) of Fig. 6 is similar to

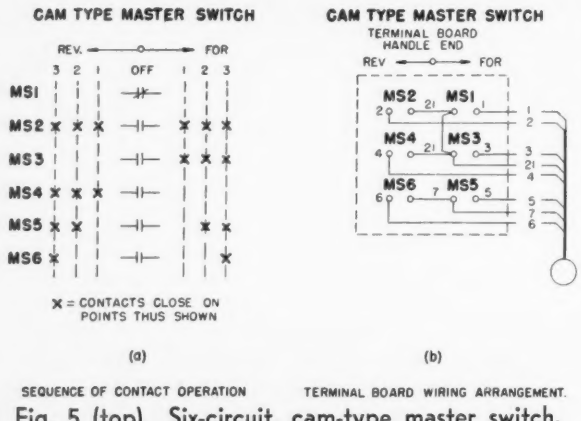



**Fig. 5 (top). Six-circuit, cam-type master switch. (Back view with cover removed).**

**Fig. 6 (bottom). Diagram symbols for cam-type master switch. Cut (a) illustrates sequence of contact operation. Cut (b) terminal board wiring arrangement.**

that shown in plate "HH" of Fig. 2. Here are shown the electrical contacts and the order in which these contacts close and open as the switch handle is moved from point to point. The "X's" in the symbol indicate that the contacts close on the points thus shown. On points where there are no "X's," the contacts remain open. For example, contact MS-1 is closed only at the "OFF" position and is open on all running points; MS-2 closes on the first point in either direction and remains closed on points two and three. The operating sequence of the remaining contacts is as indicated in the symbol.

It is customary on diagrams to show the development of the master switch in the elementary section of the print, or in a separate sequence table, and to show only the terminal board in the main part of the controller or external diagrams. Cut (b) of Fig. 6 illustrates the terminal board wiring arrangement of the master switch.

So far there have been discussed fundamental symbols and how two or more of these can be used to make up the symbol of a single device or piece of apparatus. The complete symbol of a device shows its component parts in their relative physical locations and terminals for control and power connections. Anywhere from one to hundreds of devices may be used for a single control equipment. Wiring diagrams are prepared to show how these devices are located on panels and the connections between them and apparatus which is mounted remote from the panels.

There are several different types of wiring diagrams in common use, any or all of which may be required for a particular line of apparatus or installation. These include elementary diagrams, controller diagrams, external controller diagrams, controller construction diagrams, and control sequence tables. These different types of diagrams are defined as follows in the American Standard Definitions of Electrical Terms C42. (The numbers shown after each type of diagram are the index numbers from C42.)

**"Elementary Control Wiring Diagrams 25.95.025**

An elementary controller wiring diagram is a diagram using symbols and a plan of connections to illustrate, in simple form, the scheme of control.

**"Controller Wiring Diagrams 25.95.030**

A controller wiring diagram is a diagram showing the electric connections between the parts comprising the controller, and indicating the external connections.

**"External Controller Wiring Diagrams 25.95.035**

An external controller wiring diagram is a diagram showing the electric connections between the controller terminals and outside points, such as connections from the line, to the motor and to auxiliary devices.

**"Controller Construction Diagrams 25.95.040**

A controller construction diagram is a diagram indicating the physical arrangement of parts such as wiring, buses, resistor units, etc.

**"Control Sequence Tables 25.95.045**

A control sequence table is a tabulation of the connections which are made for each successive position of the controller."

The usual practice when designing a control equipment is first to make up an "Elementary Diagram" as this affords a simplified means of visualizing the control scheme and the functioning of the individual units. The various electrical elements of each device are separated and

shown in their respective functional positions in the circuit without physical relation as to a complete device. It is also customary to separate the main power circuits from the control circuits.

In Fig. 7 there are illustrated, in elementary form, the circuits of an a-c reversing magnetic controller. The detailed wiring of this controller, using old symbols, is shown in Fig. 1. The same elementary circuits also apply to the magnetic controller shown in Fig. 9.

Along with the preparation of the elementary diagram, it is helpful at times to prepare a "Control Sequence Table." This is especially true of controllers used with master switches having several hand-controlled points which cause contactors to operate in irregular sequences, such as in the case of a dynamic braking d-c hoist controller.

A "Controller Wiring Diagram" shows the control and power wiring between devices in their relative location on the panel. This type of print is usually drawn back view as it is on the back that most connections are made and the wiremen and installation men do their work at the rear of panels. Controller diagrams of simple equipments also show the external wiring to the master switches, resistors, limit switches and motors.

### Controller Wiring Diagram

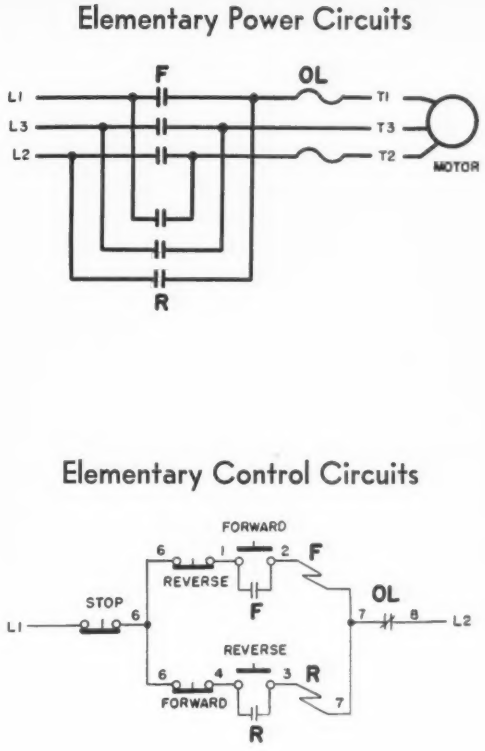
Fig. 9 illustrates a typical "Controller Wiring Diagram" for the a-c reversing magnetic unit shown in Fig. 8.

If the equipment is one of fair size and somewhat complicated, involving two or more panels, and several motors, master switches, resistors, etc., it is often desirable to prepare controller diagrams showing the internal circuits for each panel only and to draw a separate "External Wiring Diagram" to show the circuits and wiring between the panels and other apparatus.

Fig. 10 is an example of an "External Wiring Diagram" for a panel, push-button station, and motor. Normally the controller wiring diagram illustrated in Fig. 9 would be considered sufficient for this relatively simple equipment and a separate external wiring diagram would not be prepared. However, for large and intricate equipments, such diagrams serve a definite purpose and are quite necessary.

### Construction Diagrams

"Construction Diagrams" are prepared for certain equipments to show the physical arrangement of parts, such as wiring, buses, resistor boxes, etc. By far the most common use of this type of diagram is in connection with the layout and assembly of resistors. Construction prints for resistors contain a sketch or drawing of each individual box with the terminals located in their relative positions. The interconnections between



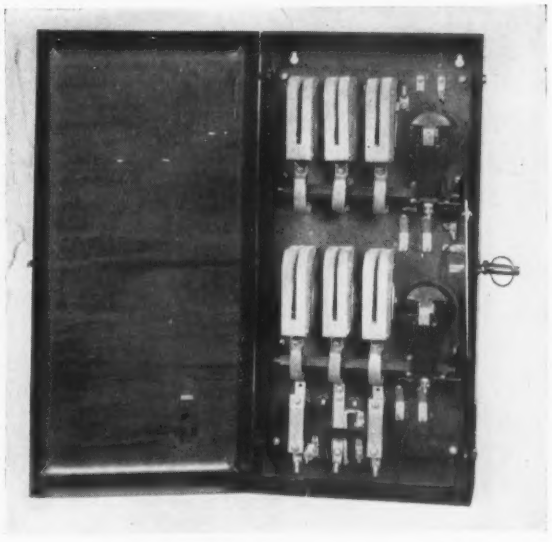



Fig. 7 (top). "Elementary diagram" of an a-c magnetic reversing controller.

Fig. 8 (bottom). A-c magnetic reversing controller.

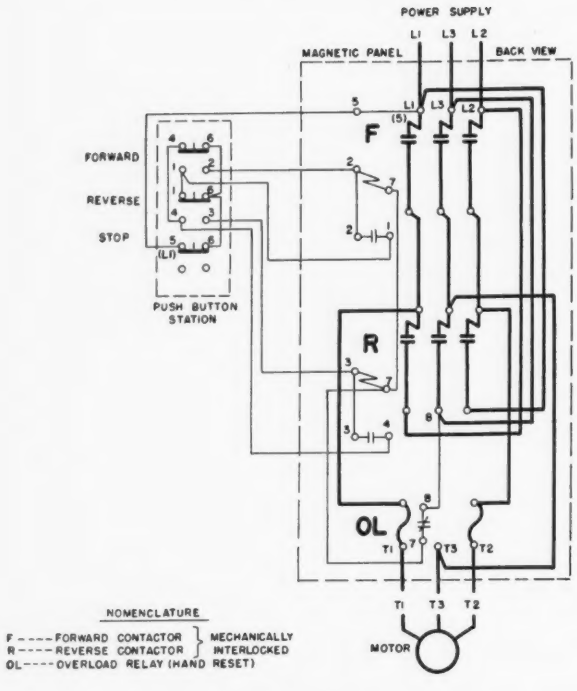



**Fig. 9. "Controller wiring diagram" for an a-c magnetic reversing controller.**

boxes are shown and a table is included which identifies the resistor sections and gives the Ohmic value for each section or step. Such drawings also serve as material lists and specify the number of grids, terminals, and frames required to build a complete resistor.

## Conclusions

The purpose of this article has been to outline briefly the history of wiring diagrams for electric apparatus and the necessity for and the development of standard graphical symbols.

The new American Standard Graphical Symbols for Power, Control and Measurement (Z32.3-1943) represents the results of many years research and investigation. During this time copies of tentative standards were distributed to members of the committee, as well as to manufacturers and others not directly represented, for such comments and suggestions as might be helpful in obtaining the best symbols possible. The committees also reviewed and discussed hundreds of symbols of all kinds and types.

In the final selection of fundamental symbols, preference was given to those which were simple in design and easy to understand and reproduce. The symbols shown in the standard are those which have widespread use and application. These symbols have been developed on the principle of a fundamental symbol for each component part of an electric device. By using these fundamentals, the maker of a diagram can create a symbol for any complete device or unit of equipment.

In addition to the fundamentals and examples now included in the standard, there will be many ideas for further standardization as progress and development continues in the electrical industry. Such ideas will in time result in greater coverage of the standard.

As the use of these symbols increases and more and more people change to them in the preparation of their diagrams, further advantages will be apparent. The user as well as the maker of wiring diagrams will gain the benefits of simplified, more readily understood, and more easily made prints, and will profit by the standardization and similarity of diagrams prepared by different manufacturers of electrical apparatus. Nationwide use of these symbols will also increase as the authors of text books, engineering publications, and other literature begin to use them in the preparation of their diagrams and other circuit illustrations.

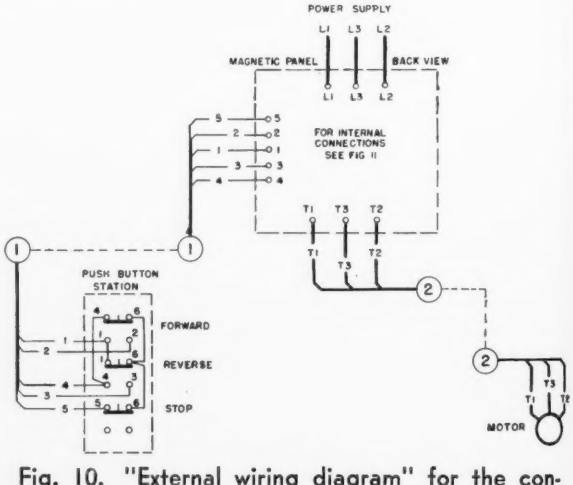



**Fig. 10. "External wiring diagram" for the controller and motor shown by the diagram in Fig. 9.**

## War Department on Standards

In its most recent regulations concerning the procurement of military supplies, the War Department has incorporated the following provision:

"Limitations—(1) Standardization. While the War Production Board representatives will be afforded every assistance for the further spreading of work to smaller plants, consistent with the maintenance of required delivery schedules and quality of production, standardization programs on items where a flow of replacement parts is a factor will also be taken into account."

## Battle Stations for All

"SIMPLIFICATION and standardization make possible a more intensive war output while helping to guarantee people their basic essentials," declares the publication *Battle Stations for All*, issued recently by the Office of War Information. The booklet explains the government's living-cost and anti-inflation program.

"By doing away with bigger and better frills, needless adornment, fancy packaging, etc, and concentrating on the production of relatively few types of goods of standardized price, design, and quality, considerable savings can be effected in manpower, materials, facilities, transportation, fuel", the booklet continues. "High-priced goods can be curtailed in favor of goods within the average person's budget. Keeping-up-with-Joneses products and styles can give way to a fuller production of essentials. The rising costs that threaten established price ceilings can be offset, and the prices of some essentials brought down."

The American Standards Association is working closely with the War Production Board and the Office of Price Administration in standardizing civilian needs. Already standards on safety shoes, civilian radio, and domestic gas ranges have been published and are being distributed widely. In works at present is the standardization of women's work clothing, and of children's body sizes.

## New ASA Company Members

FIFTEEN companies from the machine tool industry have just joined the American Standards Association as Company Members. These are:

Bryant Chucking Grinder Company, Springfield, Vermont
Colonial Broach Company, Detroit, Michigan
De Jur-Amsco Corporation, Shelton, Connecticut
Greenlee Brothers & Company, Rockford, Illinois
Illinois Tool Works, Chicago, Illinois
Kempsmith Machine Company, West Allis, Wisconsin
Kingsbury Machine Tool Corporation, Keene, New Hampshire
Landis Tool Company, Waynesboro, Pennsylvania
Logansport Machine, Incorporated, Logansport, Indiana
Midland Machine Corporation, Chicago, Illinois
Oster Manufacturing Company, Cleveland, Ohio
Pipe Machinery Company, Cleveland, Ohio
Racine Tool and Machine Company, Racine, Wisconsin
Sundstrand Machine Tool Company, Rockford, Illinois
Wickes Brothers, Saginaw, Michigan

The Merco Nordstrom Valve Company of Oakland, California, has also recently become an ASA Company Member.

## Safety Code for Bakery Equipment Requested

THE American Standards Association has been asked to organize a new project to develop a safety code for bakery equipment. The American Society of Bakery Engineers, which asked for the new project, pointed to a survey of the 1942 accident experience of a large number of bakeries throughout the United States which indicated the need for the standard.

The Society stated that such a code would be desirable in order that safety requirements might be standardized throughout the industry. It is suggested that the code might include safety requirements for the construction, installation, inspection, maintenance, and operation of bakery equipment. It is also suggested that safety features be built into bakery equipment by the manufacturers, and that a single machine design be developed which will comply with the safety requirements of a large number of states.

The ASA Standards Council is now considering this request for a new project.

*National Biscuit Company*

**The safety code for bakery equipment may cover dough mixing machines like this.**

# Standards Issued by Associations and Government

(See "ASA Standards Activities", page 174 for new American Standards and progress on ASA projects)

For the information of ASA Members, the American Standards Association gives here a list of the standards received during the past month by the ASA Library for its classified files. With the increasing amount of material being received it has been decided to eliminate from the monthly list a few of those standards which may not be so important to ASA Members, such as Federal Specifications for foods. The list below, therefore, includes only those standards which the American Standards Association believes will be of greatest interest to Members in connection with their war production.

The standards listed may be consulted by ASA Members at the ASA Library, or copies may be obtained from the organization issuing the standard. Addresses of these organizations are given for your convenience.

## Associations and Technical Societies

### American Iron and Steel Institute (350 Fifth Avenue, New York, N. Y.)

Forged Axles and Locomotive Forgings, Section 22 March, 1943 25¢

### American Society for Testing Materials (260 South Broad Street, Philadelphia, Pa.)

List of Emergency Standards and Emergency Alternate Provisions issued up to April 15, 1943

### Society of Automotive Engineers (29 West 39th Street, New York, N. Y.)

New and Revised Specifications

(Revisions are marked with an "A" or "B" following the specification number)

AMS 2574—Preservation of Engines (Limited Period)
AMS 3070A—Oil, Corrosion — Preventive (Carburetor Slushing)
AMS 3072A—Compound, Corrosion—Preventive (Aircraft Engine)
AMS 3075—Compound, Corrosion—Preventive (Parts and Equipment)
AMS 3111—Compound, Zinc Chromate, Slushing
AMS 3112—Compound, Zinc Chromate, Sealing (Unthinned) Hot Oil Resisting
AMS 3113—Compound, Zinc Chromate, Sealing (Thinned) Hot Oil Resisting
AMS 3114—Compound, Zinc Chromate, Sealing (Unthinned) Aromatic Fuel Resisting
AMS 3115—Compound, Zinc Chromate, Sealing (Thinned) Aromatic Fuel Resisting
AMS 3160—Solvent, Petroleum
AMS 3202—Synthetic Rubber, Dry Heat Resistant (55-65)
AMS 3540—Wrapper—Greaseproof Paper (Single Ply)
AMS 4118B—Aluminum Alloy, Copper Manganese, Magnesium (17S-T) Rolled
AMS 4615—Silicon Bronze, Rods and Bars, Hard
AMS 5036—Steel Sheet and Strip, Low Carbon (Aluminum Coated)
AMS 6270A—Steel .55 Ni .5 Cr .2 Mo (.12—.17 C)
AMS 6272A—Steel .55 Ni .5 Cr .2 Mo (.15—.20 C)
AMS 6274A—Steel .55 Ni .5 Cr .2 Mo (.18—.23 C)
AMS 6300—Steel .25 Mo (.35—.40 C)
AMS 6320A—Steel .55 Ni .5 Cr .25 Mo (.33—.38 C)
AMS 6322A—Steel .55 Ni .5 Cr .25 Mo (.38—.43 C)
AMS 6325A—Steel .55 Ni .5 Cr .25 Mo (.38—.43 C) (105,000 TS)
AMS 6327A—Steel .55 Ni .5 Cr .25 Mo (.38—.43 C) (125,000 TS)
AMS 6353—Steel Plate, Sheet and Strip, Chromium Molybdenum (.35—.42 Carbon)
AMS 6550—Steel Tubing (Welded) .5 Ni .5 Cr .2 Mo (.27—.33 C)

A complete set of the above specifications in loose leaf form to supplement those previously issued, plus a new Index of all Aeronautical Material Specifications 90¢

## U. S. Government

### Federal Specifications Executive Committee (U. S. Treasury Department, Washington, D. C.)

#### Federal Specifications

(Copies available from Superintendent of Documents, Government Printing Office, Washington, D. C.)

The date after the title of the specification indicates when it becomes effective.

Acid; hydrochloric (muriatic) technical-grade (new) O-A-86 May 1, 1943
Bronze; castings (amendment 2) QQ-B-691a May 1, 1943
Bronze, Manganese; castings (including manganese-aluminum bronze) (amendment 1) QQ-B-726b May 1, 1943
Brushes; cuspidor (amendment 2) H-B-171 May 1, 1943
Cable, Cord, and Wire; electric, flexible, cotton-covered (general service) (new) J-C-86 April 15, 1943
Compound; sweeping (amendment 2) P-C-591a May 1, 1943
Connectors, Wire; pressure, solderless (for electric cable and wire) (superseding W-C-601) W-C-601a May 1, 1943

**Federal Specifications—(Continued)**

Copper:
phosphor (amendment 1) QQ-C-571 April 15, 1943
silicon (amendment 1) QQ-C-581 April 15, 1943
Diathermy-Apparatus; short-wave (new) W-D-286 April 15, 1943
Enamel; lusterless, olive-drab (primarily for non-military use) (new) TT-E-514 April 15, 1943
Funnels, Glass; fluted or ribbed (amendment 1) DD-F-796 April 15, 1943
Fuses:
cartridge, inclosed, renewable (fusible links not separately inclosed), and renewable links therefor (Amendment 2) W-F-803a May 1, 1943
cartridge, inclosed, renewable (fusible links separately inclosed) (Amendment 3) W-F-805 May 1, 1943
Leather; bag (superseding KK-L-151a) KK-L-151b April 15, 1943
Motor Fuel R (new) VV-M-564 May 1, 1943
Oil; fuel for oil burners (superseding part of F.S. No. 2d) VV-O-326 May 1, 1943
Paint; exterior-primer, ready-mixed, white (undercoat for wood) (new) TT-P-25 March 15, 1943
Paper; general specifications (amendment 1) UU-P-441a April 15, 1943

**Federal Specifications—(Continued)**

Pipe; wrought-iron, welded, black and zinc-coated (amendment 2) WW-P-441a April 15, 1943
Salt; table and tablets (superseding SS-S-31) SS-S-31a May 1, 1943
Tin; phosphor (amendment 1) QQ-T-351 April 15, 1943

### U. S. Department of Labor (Washington, D. C.)

Protection of Workers in Gas and Electric Welding (Reprint of booklet issued by The Bureau of Hygiene and Sanitation of State of New Jersey Department of Labor)

### U. S. Army and Navy

List of Materials and Process Specifications for use in the maintenance and construction of aircraft. (Lists Air Corps, Army-Navy Aeronautical, U. S. Army, and Federal Specifications.) May be obtained for use in connection with Air Corps contracts and for bidding purposes upon request to the Assistant Chief, Materiel Division, Wright Field, Dayton, Ohio. Bulletin No. 23, April 10, 1943.

## ASA War Committee Starts Work On Cylindrical Fits

TO develop an American War Standard for Cylindrical Fits, including gaging specifications as requested by the Automotive Council for War Production and the War Production Board, the following ASA War Committee has been appointed.

John E. Lovely, Jones and Lamson Machine Company, *Chairman*
F. L. Armstrong, Packard Motor Car Company
W. L. Barth, General Motors Corporation
H. W. Bearce, National Bureau of Standards
C. H. Borneman, General Electric Company
Gustaf Carvelli, Wright Aeronautical Corporation
Lieutenant Commander James E. Cohn, Bureau of Ordnance, U. S. Navy Department
W. H. Gourlie, Pratt and Whitney Division, Niles-Bement-Pond Company
Colonel Harry B. Hambleton, Ordnance Department, U. S. War Department
Commander R. E. W. Harrison, U. S. Navy Department
J. Manuele, Westinghouse Electric and Manufacturing Company
E. S. Marks, Pratt and Whitney Aircraft Company
W. C. Mueller, Western Electric Company
Officer-in-Charge, Standards and Tests Section, Bureau of Ships, U. S. Navy Department
Lieutenant S. H. Stoner, Bureau of Aeronautics, U. S. Navy Department
Major A. F. Wentzel, Army Air Forces
A. M. Houser, liaison member, War Production Board
John Gaillard, ASA Staff, *Secretary*

A drafting committee of five has been appointed to develop a draft standard for consideration by the entire committee. This drafting committee has the following membership:

John E. Lovely, *Chairman*

F. L. Armstrong — W. H. Gourlie
Gustaf Carvelli — John Gaillard

The drafting committee held a meeting in New York on April 28.

## CESA Holds 20th Annual Meeting

THE Canadian Engineering Standards Association recently held its twentieth annual meeting. Twenty new standards or revised editions of existing standards had been published during 1942, it was announced. In addition, approximately forty projects were in various stages of development.

During the past year a new sectional committee was organized by CESA to deal with problems of welding. Keen interest is evident in the development of standard specifications on this subject and it is believed that completion of the standards will provide for a long-felt need of Canadian industry.

The Committee on the Canadian Electrical Code, Part 2, announced that since certain specifications under development would not be of immediate use if completed, due to the many restrictions on the use of materials required for war production, work on them would be deferred until the end of the war. These projects covered:

Capacitors (Electrical Condensers)
Transformers (A) Luminous Tube Signs (B) Oil-burner Ignition Equipment
Outlet Boxes
Temperature-indicating and Regulating Equipment
Rubber-covered Wire and Cable
Solderless Wire Connectors
CESA Requirements for Dielectric Strength and Insulation Resistance Tests
Miscellaneous Electric Tools

It was also announced that contact had been established with standardization groups in the United Kingdom and the United States so that progress made in regard to the use of steel in equipment for the armed forces in any one of the three countries might be similarly applied to the others.

# ASA Standards Activities

## Standards Available Since Our April Issue

Central Heating Gas Appliances, Approval Requirements for American Standard Z21.13-1943 $1.00
Welding Symbols and Instructions for Their Use American Standard Z32.1-1942 25¢

## Standards Being Considered by ASA for Approval

Accelerated Aging of Vulcanized Rubber by the Oxygen-Pressure Method, Methods of Test Revision of J4.1-1942 (ASTM D572-42)
Accelerated Aging of Vulcanized Rubber by the Oven Method, Methods of Test Revision of J5.1-1942 (ASTM D573-42)
Backflow Preventers in Plumbing Systems A40.6
Basic Sulfate White Lead, Tentative Specifications for (ASTM D82-42T) Revision of American Standard K7-1941
Building Code Requirements for Structural Steel (Riveted, Bolted, or Welded Construction) A57.1
Chemical Analysis of Alloys of Lead, Tin, Antimony and Copper Revision of K5-1922 (ASTM B18-36T)
Chrome Yellow and Chrome Orange, Tentative Specifications for (ASTM D211-42T) Revision of American Standard K27-1941
Copper-Base Alloy Forging Rods, Bars, and Shapes, Tentative Specifications for (ASTM B124) Revision of American Tentative Standard H7-1939
Electrical Insulating Materials C59
  Methods of Testing:
    Sheet and Plate Materials Used in Electrical Insulation (ASTM D229-42) C59.13
    Laminated Tubes Used in Electrical Insulation (ASTM D348-42) C59.14
    Laminated Round Rods Used in Electrical Insulation (ASTM D349-42) C59.15
    Molded Materials Used for Electrical Insulation (ASTM D48-42T) C59.1
    Impact Resistance of Plastics and Electrical Insulating Materials (ASTM D256-41T) C59.11
Letter Symbols for Heat and Thermodynamics Including Heat Flow Revision of Z10c-1931
Photography Z38
  Dimensions of Photographic Papers—Inch Width Rolls Z38.1.5
  Dimensions of Photographic Papers—Centimeter Size Sheets and Rolls Z38.1.6
  Dimensions of Amateur Roll Film and Backing Paper No. 1, Z38.1.7 to No. 9, Z38.1.15 (nine standards)
  Dimensions of Amateur Roll Film Spools No. 1, Z38.1.16 to No. 9, Z38.1.24 (nine standards)
  Method of Determining Photographic Speed and Speed Number Z38.2.1
  Definition of Safety Photographic Film Z38.3.A
  Lens Aperture Markings Z38.4.7
  Picture Sizes for Roll Film Cameras Z38.4.8
  Lantern Slide Projectors (exclusive of Microfilm Readers) Z38.7.3
  Testing Printing and Projection Equipment Z38.7.5
Railroad Highway Grade Crossing Protection Revision of D8-1937

### Standards Being Considered—(Continued)

Reference Data and Arrangement of Periodicals Revision of Z39.1-1935
Road and Paving Materials A37
  Methods of Test
    Amount of Material Finer Than No. 200 Sieve in Aggregates (ASTM C117-37)
    Specific Gravity and Absorption of Coarse Aggregate (ASTM C127-42)
    Specific Gravity and Absorption of Fine Aggregate (ASTM C128-42)
    Abrasion of Coarse Aggregate by Use of the Los Angeles Machine (ASTM C131-39)
    Sieve Analysis of Fine and Coarse Aggregates (ASTM C136-39)
    Distillation of Tar Products Suitable for Road Treatment (ASTM D20-30)
    Softening Point of Bituminous Materials (Ring-and-Ball Method) (ASTM D36-26)
    Ductility of Bituminous Materials (ASTM D113-39)
    Proportion of Bitumen Soluble in Carbon Tetrachloride (ASTM D165-42)
    Residue of Specified Penetrations (ASTM D234-36)
    Sieve Analysis of Mineral Filler (ASTM D546-41)
    Determination of Bitumen Revision of A37.3-1930 (ASTM D9-42)
Steel Reinforcing Bars Revision of A47-1932
Threaded Cast-Iron Pipe for Drainage, Vent, Waste Services A40.5
Zinc Coating of Iron and Steel
  Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses (ASTM A120-42)
  Zinc-Coated Steel Wire Strand ("Galvanized" and Class A ["Extra Galvanized"]) (ASTM A122-41)

## Standards Submitted for Consideration Since Our April Issue

Apparatus Bushings C76
Photography Z38
  Dimensions for
    Industrial X-ray Sheet Film Z38.1.T1
    Graphic Arts Sheet Films Z38.1.T2
    Medical X-ray Sheet Films (Inch and Centimeter Sizes) Z38.1.T3
    Professional Portrait and Commercial Sheet Films (Inch Sizes) Z38.1.T4
    Professional Portrait and Commercial Sheet Films (Centimeter Sizes) Z38.1.T6
    Photographic Dry Plates (Inch Sizes) Z38.1.VI
    Photographic Dry Plates (Centimeter Sizes) Z38.1.V2
Simplification of Wire Rope R198-43
Wet Tests C77

## New Projects Requested

Method of Testing Abrasive Stones and Wheels for Hardness
Safety Code for Bakery Equipment

# American War Standards

## Standards Approved and Published

Accuracy of Engine Lathes B5.16-1941 25¢
Allowable Concentration of Cadmium Z37.5-1941 20¢
Allowable Concentration of Manganese Z37.6-1942 20¢
Code for Electricity Meters (Revision of Paragraph 827) C12WS-1942 10¢

### Standards Approved and Published—(Continued)

Color, Specification and Description of Z44-1942 25¢
Components for Military Radio
  Ceramic Radio Insulating Materials, Class L C75.1-1943 20¢

**Components for Military Radio—(Continued)**

Electrical Indicating Instruments (2½ and 3½ Inch, Round, Flush-Mounting, Panel-Type) C39.2-1943 50¢

Fixed Mica-Dielectric Capacitors C75.3-1942 50¢

Domestic Gas Ranges, Approval Requirements Z21.1ES-1942 $1.00

Gas Water Heaters, Approval Requirements Z21.10WS-1942 $1.00

Machine Tool Electrical Standards C74-1942 40¢

Photographic Exposure Computer Z38.2-1942 $1.00

Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings and Valves (Revision of Tables 6 to 11 inclusive, American Standard B16e-1939) B16e5-1943 25¢

Protective Lighting for Industrial Properties A85-1942 50¢

Replacement Parts for Civilian Radio

Dry Electrolytic Capacitors (Home Receiver Replacement Type) C16.7-1943 20¢

Fixed Paper-Dielectric Capacitors (Home Receiver Replacement Type) C16.6-1943 20¢

Home Radio Replacement Parts, Simplified List C16.8-1943 20¢

Power and Audio Transformers and Reactors (Home Receiver Replacement Type) C16.9-1943 25¢

Quality Control

Guide for Quality Control Z1.1-1941 } In one Volume 75¢

Control Chart Method of Analyzing Data Z1.2-1941 } In one Volume 75¢

Control Chart Method of Controlling Quality During Production Z1.3-1942 75¢

Straight Screw Threads for High-Temperature Bolting B1.4-1942 25¢

## Standards Approved and Published Since Our April Issue

Components for Military Radio

Ceramic Radio Dielectric Materials, Class H C75.4-1943 20¢

Protective Occupational Footwear

Men's Safety-Toe Shoes Z41.1-1943 } In one Volume 40¢

Men's Conductive Shoes Z41.3-1943, 2nd Edition } In one Volume 40¢

Men's Explosive-Operations (Non-sparking) Shoes Z41.4-1943 } In one Volume 40¢

Men's Electrical-Hazards Shoes Z41.5-1943, 2nd Edition } In one Volume 40¢

Men's Foundry (Molders) Shoes Z41.6-1943, 2nd Edition } In one Volume 40¢

Women's Safety-Toe (Oxford) Shoes Z41.2-1943, 2nd Edition 25¢

## Standard Approved Since Our April Issue

Pressure Ratings for Cast-Iron Pipe Flanges and Flanged Fittings, Class 125 B16a1-1943

## Standards Under Way

Allowable Concentration of Toxic Dusts and Gases Z37

Metallic Arsenic and Arsenic Trioxide

Xylene

Color Code for Lubricants for Machinery Z47

Components for Military Radio C75

Capacitors

Fixed Ceramic-Dielectric Capacitors

Fixed Molded Paper-Dielectric Capacitors C75/221*

Paper-Dielectric Capacitors

Crystals

Crystals and Holders

Dynamotors

Instruments

Shock-Testing Mechanism for Electrical Indicating Instruments

Insulating Materials

Glass-Bonded Mica Radio Insulators C75/211*

Glass Radio Insulators C75/275*

Porcelain Radio Insulators

Steatite Radio Insulators

Molded Plastic Derivatives

Thermosetting Molded Plastics

Resistors

Composition Potentiometers and Rheostats

Fixed Resistors, Rated Dissipation Below 2 Watts

Fixed Instrument-Type Resistors (Bobbin or Spool Styles)

Fixed Instrument-Type Resistors (Cylindrical, End-Ferrule Styles)

Fixed Wire-Wound Resistors, 2 Watts Above

Wire-Wound Potentiometers and Rheostats

Cylindrical Fits B4

Goggles and Respiratory Equipment, Standardization and Simplification of Z2

Packages for Electronic Tubes Z45

Replacement Parts for Civilian Radio C16

Volume Controls (Home Receiver Replacement Type)

Screw Threads B1

Acme Screw Threads for Aircraft

Threading of General Purpose Nuts and Bolts

Truncated Whitworth Screw Threads

Sizes of Children's Garments and Patterns L11

Welding Arc Hand Shields and Helments Z2

Women's Industrial Clothes and Safety Clothes L17

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* Printed draft is available.

# News About ASA Standards Projects

### Abrasive Wheels B7

A revised draft is before the sectional committee for vote.

### Concentration of Gases Z37

Revised drafts of Xylene, Toluene, Formaldehyde, Methanol, Lead, and Nitrous Gases have been submitted to the sectional committee for vote.

A new committee has been appointed to investigate the applicability of the Z37 8-hour-threshold standards to exposures of women and children, and to prolonged exposures due to overtime.

### Safety Code for Woodworking Machinery O1

A revised draft is before the sectional committee for vote.

### Small Tools and Machine Tool Elements B5

A proposed standard for Spindle Noses and Arbors for Milling Machines has been sent to letter ballot. This standard was originally developed by a committee of the National Machine Tool Builders Association, was adopted by the latter Association in April, 1927, and has been widely used since. Until recently, certain features of the proposed new standard were subject to patents held by milling machine manufacturers but these patents have been relinquished to the public.

### Women's Industrial and Safety Clothing L17

The following subcommittees have been set up:

Subcommittee on Garment Dimensions and Sizes

Subgroup on Garment Materials

Subgroup on Construction

Subgroup on Essential Safety Features

Subcommittee on Safety Clothing

The first four subcommittees mentioned are all concerned with women's industrial clothing and the fifth with safety clothing as indicated. Meetings of several of these subcommittees have already been held and others are projected.

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